

Technical Support to the South African Department of Labour (DOL),
Labour Centres (LCs) and Sector Education Training Authorities (SETAs)

REPORT ON CHEMICAL INDUSTRIES EDUCATION AND TRAINING AUTHORITY STUDY TOUR ON SAFETY, HEALTH AND ENVIRONMENT

Study Tour September 2003

SUBMITTED TO USAID



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PREFACE and AFFIRMATION

This report has attempted to capture in as full and informative a manner as possible, the learning experiences of the South African Delegates on their study tour to the USA in September 2003, sponsored by USAID.

It is assumed that all material shared by the various organisations and individuals encountered on the tour is not of a confidential or restricted nature. There has been no attempt to draw any inferences from the discussions. In particular, there has been no attempt to compare organisations or to hold any one organisation above any other.

Should any such inference emerge in the opinion of the organisations and individuals concerned, be assured that this was unintentionally done and the writer apologises in advance and undertakes to rectify the report accordingly.

The writer is not aware of any copyright restrictions in the material reproduced in this report. If such restrictions in fact do exist, the writer apologises in advance and undertakes to rectify the report accordingly with the appropriate apologies and references added as may be required.

The report is submitted in good faith on behalf of the tour delegates.

L E Larson
May 2004

ACRONYMS

ACC	American Chemical Council
BB	Black Belts
BE SAFE	<u>B</u> lueprint <u>E</u> nsuring our <u>S</u> afety <u>A</u> nd <u>F</u> uture <u>E</u> conomy
CAIA	South African Chemical and Allied Industries Association
CEF	Chemical Educational Foundation
CFC	Chlorofluoro Carbons
CHEJ	Centre for Health, Environment and Justice
CHIETA	Chemical Industries Education and Training Authority
CSTL	Chemical Science and Technology Laboratory
DOL	Department of Labour
DTI	Department of Trade and Industry (DTI)
EHS	Environmental Health and Safety
EPA	Environmental Protection Agency
GHG	Greenhouse Gas
HSE	Health and Safety Executive
IPCC	Intergovernmental Panel on Climate Change
JTA	Just Transition Alliance
MBB	Master Black Belts
MS	Management System
NACD	National Association of Chemical Distributors
NIEHS	National Institute of Environmental Health Sciences
NIST	National Institute of Standards and Technology
NQF	National Qualifications Framework
NSB	National Standards Body
ODMS	Operating Discipline Management System
OEB	Occupational Exposure Bands
OEL	Occupational Exposure Limits
OSH	Occupational Safety and Health
PACE	Paper, Allied Industrial, Chemical and Energy Workers
PDCA	Plan, Do, Check and Act
REACH	Registration, Evaluation, Authorisation and Restrictions of Chemicals
SAEF	South African Excellence Foundation
SAQA	South African Qualifications Authority
SBU	Strategic Business Unit

SETA	Sector Education and Training Authority
SGG	Standards Generating Group
SHE	Safety Health and Environment
SMME	Small, Micro and Medium Enterprises
SOCMA	Synthetic Organic Chemical Manufacturers Association
USAID	United States Agency for International Development
UVGI	Ultraviolet Germicidal Irradiation
VCI	German Chemical Industry
WETP	Worker Education and Training Programme
WWHS	World Wide Health Standards

1. INTRODUCTION / BACKGROUND

1.1. Objectives of Study Tour

Reference document – Annexure 1 - USAID Study Tour Motivation

In order to address the high likelihood of underdeveloped safety, health, environmental and energy efficient policies, standards and practices in the Chemical Industries sector (particularly amongst the small industries comprising some 70% of the sector), the Chemical Industries Education and Training Authority (CHIETA) gained agreement from United States Agency for International Development (USAID) to undertake a study tour to the USA. USAID offered to sponsor 10 delegates to visit selected agencies and organisations.

The main objectives of the tour were to:

1. Expose delegates to industry best practices for handling chemicals in a safe and environmentally appropriate manner
2. Identify procedures to reduce the negative impact on the environment from careless handling of chemicals, with special attention to Responsible Care Initiatives
3. Prepare for follow-up professional development activities within the sector, incorporating said best practices, via exposure to model training programmes

The intended deliverable upon returning home is the development of a national policy and standards on Safety, Health and Environment, and incorporation into skills programmes and learnerships in the Chemical Industries sector.

The CHIETA Governing Board agreed to the study tour and to the composition of the delegates.

1.2. Delegates

Reference document – Annexure 2– Delegate List

Judy Pitts	Tioxide SA
Tshidi Magonare	CHIETA
Janina Martin	CHIETA
Gerhard Ceronie	Solidarity
Johan Coomans	Sasol Synfuels
David Duke	CHIETA
Pelelo Magane	CEPPWAWU
Masindi Mavhivha	SACWU
Bubba Naidoo	CHIETA
Len Larson	CHIETA
Sue Rollins	Tour Coordinator, Development Associates

1.3. Tour Schedule

Reference Documents

- *Annexure 3 - Tour Schedule*
- *Annexure 4 - Meeting Agendas*

The delegation departed from Johannesburg International Airport for Washington DC on Sunday 14 September 2003 and returned to South Africa on Tuesday 30 September 2003.

During the tour the delegates were based at the following locations:

Washington DC	15 September to 21 September
Wilmington Delaware	21 and 22 September
New York	23 September to 29 September

1.4. Interruption – Hurricane Isabel

Reference document – Annexure 5 – Hurricane Isabel Picture

During the tour, an unfortunate interruption was experienced due to the hurricane Isabel, which lashed the USA East Coast and caused a total shutdown of all Federal offices in Washington and most transport systems for 2 days. This resulted in the cancellation of crucial meetings with the American Environmental Protection Agency, the National Association of Chemical Distributors, the Chemical Educational Foundation and the Synthetic Organic Chemical Manufacturers Association. None of these organisations were available to make alternative arrangements to meet with the tour delegates.

1.5. Appreciation to USAID / Development Associates Inc / Sue Rollins

The tour delegates are unanimous in their praise for the manner in which Development Associates, and in particular Sue Rollins, put together a programme which was informative and well managed. The resource manual and the flawless logistics were especially appreciated. The delegates also wish to express their appreciation to USAID for a lifetime opportunity to learn more about, and experience, the environmental fellowship which will shape the survival of our planet.

2. WASHINGTON DC

Reference document – Annexure 6 – Profile of Washington DC

Itinerary

- USAID - overview of activities
- National Institute of Standards and Technology (NIST)
- Chemical Handling Training by PACE (Paper, Allied Industrial, Chemical and Energy Workers) International Union
- US Environmental Protection Agency (EPA) – cancelled
- National Association of Chemical Distributors - cancelled
- Chemical Educational Foundation – cancelled
- Synthetic Organic Chemical Manufacturers Association - cancelled

2.1. USAID – TECHNOLOGY TRANSFER OFFICE

Reference Document – Annexure 7 – USAID Technology Transfer

Dr Gilbert Jackson, Manager of the Technology Transfer Office, described the concept of Technology Transfer as a step further than the historical application of technology, expertise

or know-how from federal research and development laboratories for commercial ends. USAID's key objective is captured in their mission statement as follows:

“Promote innovative technology solutions in energy, environment, and information technology that enable small and medium-sized enterprises and municipalities in emerging and underdeveloped markets to increase efficiency and competitiveness and solve development problems leading to a more robust foundation for economic growth.”

In their drive to assist companies to become more competitive, USAID creates a robust foundation for economic growth that in turn leads to new jobs, new companies, improved environmental performance through process optimisation and reduced waste. The net result is an overall improvement in economic wellbeing and environmental quality of life.

The methodology applied to developing countries covers such strategies as technical co-operation programmes, workshops, training, conferences, study tours and information dissemination. Not only is there the possible deployment of equipment, but also the transfer of know-how associated with new approaches, thus enabling local professionals to evaluate and apply practices most appropriate to their environment.

The point made was that developing countries must grow economically without degrading their environment and the challenge is to transfer technology at an affordable cost.

Much of the challenge revolves around moving away from end-of pipe treatment. USAID's role is seen as a catalyst in assessing the market framework, providing technical demonstration and advice, and facilitating partnerships and training.

Practical examples were shared where great success had been achieved in improving cleaner production processes and know-how in several Latin American Countries. Of note was the work done at PEMEX, the world's 7th largest oil producer in Mexico. Here a combination of strategies to include energy efficient and cleaner production audits, reduced waste and pollution, communication, awareness and training, had affected savings of US\$ 500 million in 2 years with predicted savings of US\$ 1.2 billion by 2011.

Further examples of pollution reduction measures in Ecuador had realised an average payback of 10 months on an investment of US\$ 4 million.

USAID's ongoing programmes promote technical capacity building, supply chain management with emphasis in eco-certification, encouraging technology incubators, user-producer networking, waste data bank exchanges, financing solutions and networks with industry associations. A South African example of initiatives towards encouraging technology incubators could be the support of Chemin in Port Elizabeth.

2.2. NATIONAL INSTITUTE OF STANDARDS and TECHNOLOGY (NIST)

Reference Document – Annexure 8 – NIST Presentation by Dr Susan Heller-Ziesler

NIST is a non-regulatory federal agency within the U.S. Commerce Department's Technology Administration. NIST has the unique responsibility of ensuring that US industry has access to whatever measurement and standards systems that it needs to compete globally.

Its mission is to develop and promote measurement, standards and technology to enhance productivity, facilitate trade and improve the quality of life.

The Office of International Affairs, among other functions, provides advice on international science and technology affairs and arranges for NIST services to users in friendly countries. Dr Susan Heller-Zeisler presented an overview of NIST and its programmes. With some 3 100 employees, 1 600 guest researchers and an annual budget of US\$ 818 million, NIST is involved in diverse activities which include:

- Improving health care and reducing costs – more than US\$ 200 million savings in the past 10 years in terms of standards for radio-pharmaceuticals
- Strengthening US manufacturing, through its Manufacturing Extension Partnerships where a national network of more than 400 extension centres and offices assist smaller manufacturers. (A possible South African example is NAMAC with whom the CHIETA has a relationship). Many of the projects have reported savings of jobs for the disabled
- Harnessing the power of information technology
- Standards for DNA fingerprinting to assist law enforcement agencies and reducing forensic testing costs
- Enhancing national security through intelligent machines influenced by a real time control system
- Unique measurement and research facilities

There are 7 Measurement and Standards Laboratories covering Electronics and Electrical Engineering, Manufacturing Engineering, Chemical Science and Technology, Physics, Materials Science and Engineering, Building and Fire Research and Information Technology.

The delegates visited the Chemical Science and Technology Laboratory (CSTL). This laboratory conducts research in measurement science and develops the chemical, biochemical and chemical engineering measurements, data, models and reference standards that are used to improve public health, safety and environmental quality. CSTL has 5 divisions – viz. Biotechnology, Process Measurements, Surface and Microanalysis Science, Physical and Chemical properties and Analytical Chemistry.

Dr Ellyn Beary (Senior Scientific Advisor in the CSTL) and some colleagues presented an impressive information system which is an integral aspect of the NIST Quality System. This web-based, database-driven system is used by all divisions and was created to:

- store all administrative, technical and financial calibration data
- control documentation
- track status of calibration equipment
- track turnaround time
- generate financial and calibration related reports
- automate the billing process
- generally increase customer satisfaction

A tour was conducted to the Analytical Chemistry Division's Ozone Standards and Gas Metrology Laboratory. One of the many products is the preparation of reference standards and equipment for air pollution determinations. This could be of interest to the Durban South area in terms of air measurements – e.g. NO_x and Ozone.

Specific programmes in which NIST is involved include:

- Advanced Technology Programme – is a unique partnership between the government and the private sector, to conduct high-risk research to develop new technologies of potential commercial and economic benefit. The focus is on industry-led research and supports technologies that are essential for the development of product, processes and services. The cost of actual product development, production, sales and distribution is borne by the private sector.
- Baldrige National Quality Programme – to recognise individual US companies for their achievements, to promote quality awareness, to provide information on successful performance and competitive strategies. Awards are not for specific products or services and may be given annually to companies in the manufacturing, services and small business categories. NIST manages the programme in conjunction with the private sector.

A possible South African equivalent is the South African Excellence Foundation (SAEF), which strives to promote continuous improvement through an excellence model. The CHIETA has investigated this model and it is considered useful to gauge continuous improvement in business practices. A web link is www.saeef.co.za.

- Manufacturing Extension Partnership – is of particular interest in that it provides hands-on help to smaller manufacturers to become globally competitive through latest business practices (quality management, HR development, financial planning) and technical assistance (e-commerce, process improvement, plant layout, product development, energy audits).

In the USA there are more than 380 000 small and mid-sized manufacturers (98% of the nation's manufacturers) that produce some 55% of value added in manufactured goods. They employ more than 12 million workers, equivalent to 75% of all US manufacturing workers with high-skilled, high-wage jobs.

There is an ever growing dependence on smaller companies (< 500 workers) for services and components. It follows that their performance and capability is crucial to the national economy. The barriers faced by the smaller companies are not dissimilar to those in South Africa – limited budgets, little in-house expertise, inadequate methodologies, equipment and management practices. The Manufacturing Extension Programme helps firms to overcome some of these barriers through the 400 odd manufacturing extension centres located nationwide, which provide assistance through assessment, technical and business solutions, access to resources, seminars and training.

Comparisons in South Africa are not yet to hand, however it is of interest to note that in the chemical industries sector, 90% of companies are small enterprises providing 24% of jobs in the sector – some 26 000 people. In the South African chemical industries sector, on average, about 10 workers are employed per small company. The CHIETA is currently sponsoring research into the sector make-up.

The South African Department of Trade and Industry (DTI) has the responsibility of implementing the government's National Integrated Small Business Strategy. Aimed at

small, medium and micro industries (< 150 workers) the DTI has developed policies and institutions to address some of the barriers constraining SMMEs. These include:

- Ntsika Enterprise Promotion Agency – provides business development services to SMMEs. (www.ntsika.org.za)
- Khula Enterprise Finance – facilitates loan and equity capital to SMMEs. (www.khula.org.za)
- NAMAC Trust – supplies high quality information and advisory services to SMMEs through Manufacturing Advisory Centres. (www.namac.org.za)

2.3. CHEMICAL HANDLING TRAINING

Reference documents:

- *Annexure 9 – PACE – Name that Chemical*
- *Annexure 10 – PACE – Systems of Safety*
- *Annexure 11 – PACE – Toxic Flammable Gas Release – Lessons Learned*

This intervention took place at the George Meany Centre for Labour Studies in Silver Spring, Maryland, under the umbrella of the Worker Education and Training Programme (WETP).

The WETP is a federally funded program administered by the National Institute of Environmental Health Sciences (NIEHS). WETP supports the training and education of workers in non-profit organisations engaged in activities related to hazardous materials and waste generation, removal, containment, transportation and emergency response. NIEHS provides grants to community-based non-profit organisations throughout the US who have a demonstrated track record in providing high quality occupational safety and health education to implement the WETP.

Among these grantees is the PACE International Union (Paper, Allied Industrial, Chemical and Energy Workers). PACE was offering a refresher course in the handling of chemicals to two of its member organisations, and the South African delegation was invited to participate in the training.

Prior to the training, the delegation was joined by Dr Bruce Lippy of MDB, Inc. As Director of the National Clearinghouse for Worker Safety and Health Training for NIEHS, Dr. Lippy compiles the training materials for 18 grantee organisations and makes them available through a web page (www.wetp.org). Dr. Lippy set the scene for the importance of health and safety training in the chemical industry.

In the US there are approximately 79 000 chemicals in use, of which the Occupational Health and Safety Act regulates approximately 600, most of which were compiled in 1970. There is almost no data available on synergism and there are massive gaps in knowledge. There is deep concern about terrorist attacks and in particular the impact on people who are at risk due to their proximity to chemical facilities that have toxic worst-case scenarios. The Environmental Protection Agency (EPA) has declared 123 of such facilities as putting nearly 1 million people living nearby at risk.

Priorities to address the perceived problem include:

- training for a nation wide cadre of environmental response workers

- a national registry of skilled construction personnel in relevant crafts to respond to a national disaster
- appropriate rescue training for workers who participate in immediate response activities
- new hazardous waste refresher course modules to cover emergency response and clean up
- training for workers who clean up buildings contaminated with biohazards such as Anthrax

To date the WETP has carried out training to over 1 million workers and has delivered some 57 000 courses, accounting for over 15 million contact hours of health and safety training. Since 1970 the WETP has received federal funding of over US\$ 413 million.

The PACE training programme presented to the delegates included the following:

- Name That Chemical - *Annexure 9* - to practise using Material Safety Data Sheets, The National Institute for Occupational Safety and Health Pocket Guide and the Department of Transportation 2000 Emergency Response Guidebook. The purpose was to learn more about some of the chemicals that workers might be exposed to in the workplace and the mechanisms to identify them
- Systems of Safety – *Annexure 10* – to introduce the concept of systems of safety in accident prevention and the use of a logic tree as a tool for graphically depicting and organising investigation information and for establishing cause and effect relationships. Major systems of safety that were introduced included design and engineering, maintenance and inspection, mitigation devices (e.g. relief valves), warning devices (i.e. alarms), procedures and training, and human factors.
 - Toxic Flammable Gas Release from Rail Car Kills 3 – *Annexure 11* - Lessons Learned – to explore the value of small group discussions to share information gained from incident investigations, i.e. “toolbox talks”

A participant at the training session was Dr Janice View, Executive Director of Just Transition Alliance (JTA). This national minority NGO comprises the Asian Pacific Environmental Network, the Southwest Network for Environmental and Economic Justice and the Indigenous Peoples Network. An interesting and very responsible intervention is the way in which JTA and PACE are jointly trying to understand and balance each other's perspective on plant closures, and oppose the adverse environmental impacts on the neighbourhoods surrounding the plants. This is a very useful contact through www.JustTransition@aol.com

Yet another participating group was led by Steven Lester, Science Director from the Centre for Health, Environment and Justice (CHEJ). This organisation seeks to facilitate organisations and citizens coming together to take a stand in holding industry accountable and working towards a healthy, sustainable future. Their BE SAFE platform (Blueprint Ensuring our Safety And Future Economy) adopts the approach of “better safe than sorry” and is motivated by caution and prevention techniques and underpinned by the following principles:

- Heed Early Warnings – when there is credible evidence that harm is occurring or likely to occur, government and industry have a duty to prevent harm, even when the exact nature and magnitude are not yet fully proven

- Put Safety First – government and industry have a duty to thoroughly study the potential for harm from a new chemical or technology before it is used, rather than assume it is harmless until proven otherwise
- Exercise Democracy – government and industry decisions should be based on meaningful citizen input and mutual respect, and the highest regard for those whose health and safety may be affected and for irreplaceable natural resources – above those with financial interests
- Choose the Safest Solution - decisions by government, industry and individuals must follow an evaluation of alternatives and require the use of the safest, technically feasible solution

CHEJ are canvassing for member organisations and individuals to work together in educating and mobilising the public to take a stand and sign the national platform to be delivered to the White House in January 2005. A web link is www.besafenet.com

2.4. U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

A federal agency, the EPA develops and enforces regulations that implement environmental laws enacted by the U.S. Congress. The EPA is responsible for researching and setting national standards for a variety of environmental programs and delegates to states and tribes the responsibility for issuing permits and for monitoring and enforcing compliance. The EPA also currently sponsors voluntary partnerships and programs with industries, NGOs and state and local governments on over 40 voluntary pollution prevention programs and energy conservation efforts.

Unfortunately this programme was cancelled due to the hurricane Isabel and could not be rescheduled. Attempts will be made to access presentation material.

2.5. NATIONAL ASSOCIATION OF CHEMICAL DISTRIBUTORS (NACD) and CHEMICAL EDUCATIONAL FOUNDATION (CEF)

NACD is an international trade association representing chemical distributors, typically small businesses. A condition of membership is a signed commitment to the NACD Responsible Distribution Process (RDP) as well as verification of members' RDP policies and procedures by a third-party firm.

CEF was originally founded to establish a chemical product stewardship network to disseminate information to the NACD distributor members' customers and their communities. The scope of the Foundation eventually evolved so that CEF now serves the chemical industries as a whole. CEF educates suppliers, distributors, customers and the general public, especially children, about the safe handling of chemicals.

Unfortunately this programme was cancelled due to the hurricane Isabel and could not be rescheduled. Attempts will be made to access presentation material.

2.6. SYNTHETIC ORGANIC CHEMICAL MANUFACTURERS ASSOCIATION (SOCMA)

SOCMA is a trade association serving the speciality-batch and custom chemical industry. SOCMA is the voice of companies that are small to medium in size, as defined by the U.S. Small Business Administration. As a trade association that represents a unique sector of the

chemical industry, SOCMA often has a different perspective on issues than that of other chemical manufacturing trade associations. SOCMA's Association Management Centre is a full-service resource centre for managing chemical and related industry associations.

Unfortunately this programme was cancelled due to the hurricane Isabel and could not be rescheduled. Attempts will be made to access presentation material.

3. WILMINGTON DELAWARE

Reference Document – Annexure 12 – Profile of Wilmington

Itinerary:

- DuPont Company

3.1. DuPont

Reference Documents:

- *Annexure 13 - DuPont Commitment to Safety Health and Environment*
- *Annexure 14 - Energy and Environment Goals*
- *Annexure 15 - Safety Health and Environment Philosophy*
- *Annexure 16 - The Six-Sigma Process to Improve Business and Environmental Results*
- *Annexure 17- DuPont's Sustainable Growth Mission*
- *Annexure 18 - DuPont's Participation in Climate Change Studies*

Founded in 1802 as an explosives company, DuPont today is a science and technology company that works in a wide range of areas including food and nutrition, health care, apparel, safety and security, construction, electronics and transportation. Strengths in polymer science and chemistry built the modern DuPont, and the company continues to broaden its traditional technical platforms in chemistry and materials science through applied research in biotechnology.

With revenues of US\$ 25 billion, DuPont employs 79 000 people in 70 countries and includes some 370 manufacturing, research and development, and customer service facilities. DuPont operates in diverse sectors including automotive, construction, apparel, food, electronics and chemicals.

During the meetings with DuPont, it was unfortunate that no site visits were included. There were several presentations and discussions involving:

3.1.1. SHE Commitment

Reference document – Annexure 13 - DuPont Commitment to Safety Health and Environment

DuPont has a slogan – “If you can manage safety, you can manage a business – if you cannot manage safety, you cannot manage a business”. Their vision and targets reflect this deep commitment to safety and their right to operate is underpinned by a desire for zero accidents, zero injuries and zero incidents. The safety culture has moved beyond a reactive mode, through dependence, independence and on to an interdependent culture. There is co-operation within and across teams. The mentality of being a brother / peer keeper exists, supervision is comfortable to lead or let others lead and teams are involved in goal setting and improvements.

A strong management commitment underpins 12 Behavioural Safety Elements. The DuPont approach to developing sustainable safety excellence involves:

- Assessment – analysis and strategic planning
- Solution design – recommendations and action planning
- Implementation – training, coaching, counselling, sharing best practices

DuPont offer safety consulting services which include Behavioural Safety Management Evaluation, Process Safety Risk Management Evaluation, Contractor Safety Management Evaluation and Integrated Safety Excellence Journey. Their client base using Safety Resource Services includes diverse organisations of different sizes and types.

The core direction of DuPont is sustainable growth - the creation of shareholder and societal value while reducing the environmental footprint. There is a worldwide support for Responsible Care, a key programme to achieve DuPont's SHE commitments.

3.1.2. Energy and Environment Overview

Reference Document: Annexure 14 - Energy and Environment Goals

Aldo Morell, Director of DuPont Safety Health and Environment Excellence Centre, presented an overview of the Energy and Environment initiatives. DuPont defines Sustainable Growth as “The Creation of Shareholder and Societal Value while Decreasing the Environmental Footprint along the value chains in which we operate”. In the above context “Footprint = injuries, illnesses, incidents, waste, emissions, and depletable forms of raw materials and energy”.

Holding to a strong commitment to maintaining their “permission to operate” and with a high sense of responsibility, DuPont has set high and exacting energy and environmental goals for the period 1990 to 2010. These are:

- Energy Efficiency
 - Hold total energy use flat, 1990 through 2010

In the decade of the 1990's production grew by 35% while energy use remained flat, resulting in significant financial savings
- Greenhouse Gas (GHG) Emissions
 - Reduce GHG emissions by 65% (CO₂ equivalent basis) by 2010 vs. base year of 1990
- Renewable Energy
 - Supply 10% of total DuPont energy needs from renewable resources at a cost competitive with best available fossil derived alternatives

The success in achieving these goals revolves around strategies, performance commitments and leadership at the business and site level. DuPont is on track at this time.

3.1.3. Safety Health and Environment (SHE) Overview

Reference Document: Annexure 15 - Safety Health and Environment Philosophy

Mike Deak, Corporate Director – Safety and Health presented an overview of DuPont's SHE performance. Having commenced operation in explosives manufacture in 1802, the first safety rules were compiled in 1811 and safety statistics gathered in 1912.

Founder E I du Pont affirmed that - *"Safety is a line management responsibility"*. He further directed that - *"No employee may enter a new or rebuilt mill (plant) before top management has personally operated it"*. It was also a requirement that top management were housed in close proximity to the explosives manufacturing facilities. It is these strongly held foundations that have set the scene for DuPont's impressive safety record.

It was emphasized that safety performance impacts across the total spectrum of business activities. DuPont contends that not only are the injured and their families affected, but knock-on effects impact on employee relations, profitability, productivity, quality, customer satisfaction, contract and insurance costs, public image and regulatory agency reactions.

DuPont is driven by the following 4 core values which are fundamental to who they are, what they do and essential to sustainable growth:

- Safety and Occupational Health
- Ethics
- Environmental Stewardship
- Fair treatment of People

Compliance with the SHE Commitment (see Annexure 14) is the responsibility of every employee and contractor acting on behalf of DuPont and is a condition of employment. Management in particular has the responsibility to train and motivate employees to understand and comply with the commitment and applicable laws.

The DuPont SHE philosophy is founded on the following firmly entrenched beliefs, and is seen to be alive and well in "Best" Businesses and at "Best" Sites:

- All incidents are preventable
- Management is responsible and accountable for safety, health & the environment
- All operating exposures can be controlled
- Working safely is a condition of employment
- Employees must receive safety, health & environmental training.
- Management audits are a "must"
- Deficiencies must be corrected promptly
- Off-the-job safety is important
- Good safety, health & environment is good business
- Employees are the key

The DuPont SHE culture is based on "FELT Leadership" which recognizes the interrelationships of People, Processes and Technology to achieve Results. Surrounding this core are systems and behaviours including proactive demonstration of values and high expectations, clearly defined conditions of employment, constant measurement and feedback, performance linked to compensation, employee engagement and shared knowledge, rewards and recognition, systems and procedures, uniformity, intensity and passion.

There are great expectations of management which cannot be delegated. These include:

- Top Management Commitment and FELT Leadership for Safety, Occupational Health & Environment Being No. 1 Value
 - Create the Environment - Constancy of Purpose
 - Clearly Stated Objectives - Do Not Compromise Expectations
 - Safety, Health & Environment Integrated Into Business Processes
- Line Management Personally Accountable and Responsible for Safety, Occupational Health & Environmental Performance
 - FELT Leadership/commitment
 - Field Visibility
 - Walk the Talk
 - Incident Investigation Process

DuPont firmly believes that demonstrated management commitment is the single most critical element of safety, health & environmental excellence, with leadership at the core. Their goal is “0” (accidents, injuries, incidents).

3.1.4. Six Sigma

Reference Document: Annexure 16 - The Six-Sigma Process to Improve Business and Environmental Results

Judy Passwater, Director Engineering explained how DuPont is using the Six Sigma model to improve business and environmental results.

This actively practiced business improvement process, results in financially verifiable and sustainable solutions, and focuses on the elimination of defects and reduction in variability.

Developed by Motorola in 1994, this process is spreading across the world and across sectors. It defines excellence in terms of the number of defects per million opportunities. A table depicting the Sigma levels is as follows:

<u>Sigma Level</u>	<u>Defects per Million Opportunities</u>
6 sigma	3.4 (99.99966% good)
5 sigma	233 (99.98% good)
4 sigma	6,210 (99.4% good)
3 sigma	66,807 (93.3% good)
2 sigma	308,537 (69.1% good)
1 sigma	690,000 (31% good)

Practical examples of the Sigma grading are in the table below

3.8 Sigma (99% good)	6 Sigma (99.99966% good)
20,000 lost articles of mail per hour	Seven articles lost per hour

Unsafe drinking water for almost 15 minutes each day	One unsafe minute every seven months
5,000 incorrect surgical operations per week	1.7 incorrect operations per week
Two short or long landings at most major airports each day	One short or long landing every five years
200 000 wrong drug prescriptions each year	68 wrong prescriptions per year

On the safety front, DuPont appears to be world best, at better than 6 Sigma.

Where ISO standards define the “what”, Six Sigma develops the “how”. Essentially the Six Sigma methodology is a disciplined problem solving approach which follows a structure of:

- A customer (internal or external) expressing a view and giving input
- Developing a project with a disciplined approach involving 17 steps
- Relying on data and facts that are credible and verifiable
- Ending with a sustainable control plan that is specific

The Six Sigma methodology revolves around:

- Define – the problem / opportunity
- Measure – what has happened?
- Analyse – why did it happen?
- Improve – how it happens to our benefit?
- Control – sustain the gain

Intensive training in the methodology is applied in the organisation. There is a hierarchy of competencies which are denoted the term “xyz belt” as in the Ju Jitsu grading. For example:

- Green Belts have undergone at least 9 days training and have completed at least 1 Six Sigma project successfully
- Black Belts (BBs) typically are project managers and engineers who have a proven success rate in terms of hard dollars. They are expected to produce financial contributions of not less than 7 times their annual salaries
- Master Black Belts (MBBs) oversee several Black Belts
- Champions oversee several Master Black Belts

Typically the Six Sigma interventions are resourced with 2 Full Time Six Sigma staff members (“black belts”) allocated for every 100 employees in a Strategic Business Unit (SBU). Roles are sequenced as follows:

- Leader ... led by top management - CEO
- Champion ... leads the rollout for SBU, networks with other SBUs
- Project Champions ... selects projects, guides BBs & MBBs
- Master Black Belts ... trainers and mentors of BBs, lead projects
- Black Belts ... lead projects and train project teams
- Green Belts ... support / resource projects / culture change
- Project Team Members ... execute projects

For the years 1999 to 2003, the following has been achieved:

- Master / Black Belts trained : 2 500
- Green Belts trained : >14 000
- Projects completed : >14 000
- Revenue improvement : >\$1.2 billion
- Bottom line improvement : >\$1.5 billion

A valuable lesson from this exposure was the importance of measurement and creating a “dashboard of indicators” for critical key outputs and deliverables to indicate improvements in business performance and to inform corrective action as appropriate.

More information about Six Sigma, may be obtained from IQPC in Johannesburg at www.iqpc.co.za

3.1.5. Sustainability at DuPont

Reference Document: *Annexure 17 – Sustainable Growth Mission*

This presentation by Aldo Morell, Director of DuPont Safety Health and Environment Excellence Centre, mapped out DuPont’s mission to journey from mere compliance with regulatory requirements, to gaining public trust and through to delivering societal value – i.e. Sustainability at DuPont’s core.

In their commitment to their Stakeholders (Customers, Employees, Communities and Shareholders), DuPont ensures equal attention to the interlinking Economical, Societal and Environmental elements.

Their framework for a sustainable enterprise depicts the move from where they are today, towards a desired future. That framework is reproduced below:

TODAY	
INTERNAL	EXTERNAL
Cost & Risk Reduction <ul style="list-style-type: none"> – Productivity/Six Sigma – Footprint Reduction 	Reputation & Legitimacy <ul style="list-style-type: none"> – Core Values & Policies – Product Stewardship – Openness & Transparency – Stakeholder Engagement – Real Progress
TOMORROW	
INTERNAL	EXTERNAL
Innovation & Repositioning <ul style="list-style-type: none"> – Portfolio Rearrangement – Integrated Science – Knowledge Intensity 	Growth Path & Trajectory <ul style="list-style-type: none"> – Aligning Customer and Societal Values – Non-traditional Partnerships – Emerging Economy Strategies

DuPont has determined that, of the various economies in the world, most of their products only reach a small number of people in mature economies, with none reaching emerging and survival economies. There are major opportunities for growth, especially in emerging economies where some 1 500 million people have purchasing power parity of between US\$1 500 to US\$10 000. What is necessary is to rethink product concepts, new methods of sales and marketing, technology development to match needs and conditions of larger segments of

the population. It is estimated that in Bangladesh alone there is business opportunity to the value of between \$100 billion and \$200 billion.

An example was an intervention in the village of Grameen in Bangladesh, an isolated rural community with a per capita of US\$286 per year. Like half of the global population, most of these people had not ever made a telephone call. A project was set up with women in Grameen, to establish public telephones situated so that they were within 10 minutes walking distance for the people. A pilot project was initiated to install 950 telephones (40 000 would be needed eventually), by providing US\$175 loans to set up village operators, initially as a non-profit experiment. Results were impressive:

- ✓ Environmental – avoided material intensive infrastructure; significantly reduced transport
- ✓ Societal – women were empowered; village operators' income increased by up to 40%
- ✓ Economic – consumers saved up to 10% on call costs; income in the village increased; usage and revenue was found to be 2 to 3 times higher than urban cell phones

DuPont contends that there is much potential to finding the connection between “Societal Value” and top line growth.

3.1.6. Participation in Climate Change Studies

Reference Document: Annexure 18 - DuPont's Participation in Climate Change Studies

Dr Mack McFarlane, Principal Scientist Environmental Programme presented DuPont's stance on the issue of addressing the problem of global climate change.

It is well established that global warming and climate change is a reality and that probably human activity is the most likely cause. For example 1 litre of fuel burned in a combustion engine gives rise to 2.4 kg of Carbon Dioxide. The rapid increase in the use of fossil fuels for energy and other gaseous emissions such as Chlorofluoro Carbons (CFC's) have led to significant depletion of the Ozone layer with resultant warming of the earth's surface. The ironic result is that with the warming comes melting of the polar ice caps. This leads to an increased flow of cold water into the seas. The result is possible interference with warm ocean currents which shape climates, and a possible knock-on effect of turning certain areas of the world to colder climates and even possibly returning to another ice age. The debate rages on.

That there should be deep concern is without a doubt. Concern should exist in individuals, communities, companies, governments. DuPont has taken this concern to heart and has a long history of involvement in the science of ozone depletion. As far back as 1972, DuPont initiated the formation of the Fluorocarbon Programme Panel. They have participated in many initiatives, programmes, reports and assessments under the Montreal Protocol. In 1988 DuPont committed to phasing out CFC's and since 1990 has participated in the Intergovernmental Panel on Climate Change (IPCC).

The IPCC provides the information basis for decisions on climate change. It was set up by UNEP and WMO in 1988 and comprises a plenary of government representatives, a small bureau of elected experts and a large volunteer group of international scientists and technical experts. The product of their work is conducting assessments and compiling special reports.

DuPont's concern led to the establishment of goals and commitments which state that by 2010 they would:

- reduce their global carbon-equivalent greenhouse gas emissions by 65% using 1990 as a base year;
- hold energy flat using 1990 as a base year
- source 10% of their global energy use in the year 2010 from renewable resources

Unhappily, many industries do not participate in the IPCC initiatives, but DuPont sees major benefit in participation by way of protecting their reputation, directing their strategic planning and assisting in policy dialogue.

4. NEW YORK

Reference Document – Annexure 19 - Profile of New York Itinerary:

- Dow Chemical Company
- Pfizer Inc
- Alcoa Inc
- Environmental Defence

4.1. DOW CHEMICAL COMPANY

Reference Documents:

- *Annexure 20 - Understanding management systems and their value including Responsible Care and ISO – 1400*
- *Annexure 21- Implementing an Integrated Management System*
- *Annexure 22 - Case study – Dow's Operating Discipline Management System and its role in achieving results*

Dow is a science and technology company that provides chemical, plastic and agricultural products and services to a wide range of markets including food, transportation, health and medicine, personal and home care, and building and construction.

The meeting with Stephen Rose, Director of Dow's Responsible Care and Operating Discipline Management System, focused on the role that an integrated management system plays in developing, achieving and maintaining Environmental Health and Safety policies, standards and performance goals.

4.1.1. Understanding Integrated Management Systems and their Value

Reference Document: Annexure 20 - Understanding management systems and their value including Responsible Care and ISO – 1400

Stephen Rose explained a management system ISO terms as an integrated set of

- Policies and requirements
- Organisational structure

- Planning activities
 - Work processes
 - Roles and responsibilities
 - Standards / best practices
 - Procedures
 - Resources
- all used by an organisation and its people to define, implement, check maintain and continually improve the organisation's overarching policies and to achieve the business and functional objectives, targets and performance results. In doing so it ensures that specific aspects of a business are controlled by effectively and efficiently managing day-to-day work.

A well defined and functioning management system comprises the activities of Plan, Do, Check and Act (PDCA) with sub-activities as follows:

PLAN	
<ul style="list-style-type: none"> Define aspects and impacts Objectives and Targets Programme Management 	<ul style="list-style-type: none"> Understand those things that can have an impact Set direction Develop programmes to facilitate achieving objectives and targets
DO	
<ul style="list-style-type: none"> Training Communication Document Management Procedures Management of Change Empowerment 	<ul style="list-style-type: none"> Assure competence Inform internal / external stakeholders Establish, maintain and control documents Identify, establish, maintain and ensure consistent use of procedures to comply with requirements Changes reviewed, approved, training complete and communicated Employee potential used to achieve objectives and targets
CHECK	
<ul style="list-style-type: none"> Measurements Self Assessment Investigate Preventative / Corrective Actions Audit Record Management 	<ul style="list-style-type: none"> Quantify performance Ensure compliance Analyse incidents (gaps / non-conformance) Plans to prevent or correct gaps Verify that work activities are consistent with defined management system Records established, maintained and controlled to demonstrate effective operation and conformance to requirements.
ACT	
<ul style="list-style-type: none"> Management System Review 	<ul style="list-style-type: none"> Is the Management system giving us the desired results? What improvements should we make?

By way of example, Stephen Rose presented the American Chemical Council (ACC) Responsible Care® Management System, explaining that it was an outcome or desired state of performance – i.e. continuously improving Environmental Health and Safety (EHS) and performance through using an integrated management system. The elements of the ACC Responsible Care® initiative are:

- Responsible Care® Guiding Principles
- Responsible Care® Codes of Management Practice
- Responsible Care® Management System
- Mandatory Third-party certification
- Expanded performance metrics
- Public transparency of performance metrics

The 10 guiding principles of the Responsible Care® initiative are captured in the following statements:

- Continuous progress towards our vision of no accidents, injuries or harm to the environment.
- Publicly report global EH&S performance
- Lead companies in ethical ways that increasingly benefit society, the economy and the environment
- Seek and incorporate public input
- Make EH&S and resource conservation critical considerations for all new and existing products
- Provide information on health or environmental risks and pursue protective measures
- Work with customers, carriers, suppliers, distributors to foster safe use, transport and disposal of chemicals.
- Operate facilities in a manner that protects the environment.
- Support education and research
- Work with others to resolve problems of the past

Responsible Care® Codes and Management Practices are as follows and further details may be sought from the South African Chemical and Allied Industries Association (CAIA) in Johannesburg at info@caia.co.za:

Codes	Management Practices
CAER	19
Pollution Prevention	14
Process Safety	22
Distribution	21
Employee Health & Safety	18
Product Stewardship	12
Security	13

An interesting comparison was discussed comparing elements of various initiatives impacting on the chemical sector. This is a draft document compiled by the American Chemical Council and attempts will be made to access it. Comparisons included:

- Responsible Care® Management System Technical Specification
- ISO 14001:1996
- Responsible Care® 14001 Management System
- OHSA's Voluntary Protection Programme
- Responsible Care® Codes of Management Practice
- Occupational Health and Assessment Series 18001
- ISO 9001:2000
- National Enforcement Investigative Centre Environmental Management System

It was evident from the performance statistics presented that the implementation of a well defined and functioning Management System has significant benefits to Dow Chemical Company in terms of Safety Performance, Gaseous Emissions and Energy Efficiency. There were many learning points and in particular the immense importance of Responsible Care® and its value to SMMEs. In this regard, the Chemical and Allied Industries Association (CAIA) could play a vital role.

4.1.2. Implementation of an Integrated Management System

Reference Document: Annexure 21- Implementing an Integrated Management System

A model was presented on the steps involved in developing and implementing a Management System. This is not a “quick fix” issue and could take up to 3 years to reach full application. However every small step made towards improving business performance and especially SHE performance is well worth the effort.

There are 3 distinct phases involved:

1. Develop a strategy and gain commitment. This must be driven from the very top of the organisation
 - Commit to Implementation
 - Appropriate Leaders receive training
 - Develop Strategy & Scope
 - Train Element
 - Focal Points and Coordinators
 - Communication
2. Measure gaps – i.e. what the difference is between the situation now and what is desired in future
 - Develop Gap Assessment Tools
 - Conduct Gap Assessments
 - Review Results
 - Prioritize Opportunities
 - Leadership Feedback
3. Close the gaps
 - Functional Implementation Plan
 - Department Implementation Plan
 - Execute Plans

It was emphasised that there is a need to assign 3 key roles to ensure effective development and implementation of a Management System (MS):

- MS Leader – to ensure that things are done right. This could take some 40% to 60% of the individuals time
- MS Coordinator – leads the MS effort in one department. Must be an excellent instructor and respected by all
- Functional Element Focal Points (Code Coordinators) – subject matter experts to provide expert input to each element in the Management System

Management Systems are not an optional extra. In fact the South African Qualifications Authority (SAQA) demands a MS as the minimum criteria for gaining accreditation as an Education and Training Provider, proof of an adequate Management System in the organisation.

The model presented in *Annexure 21* provides a useful guide on how to implement a Management System.

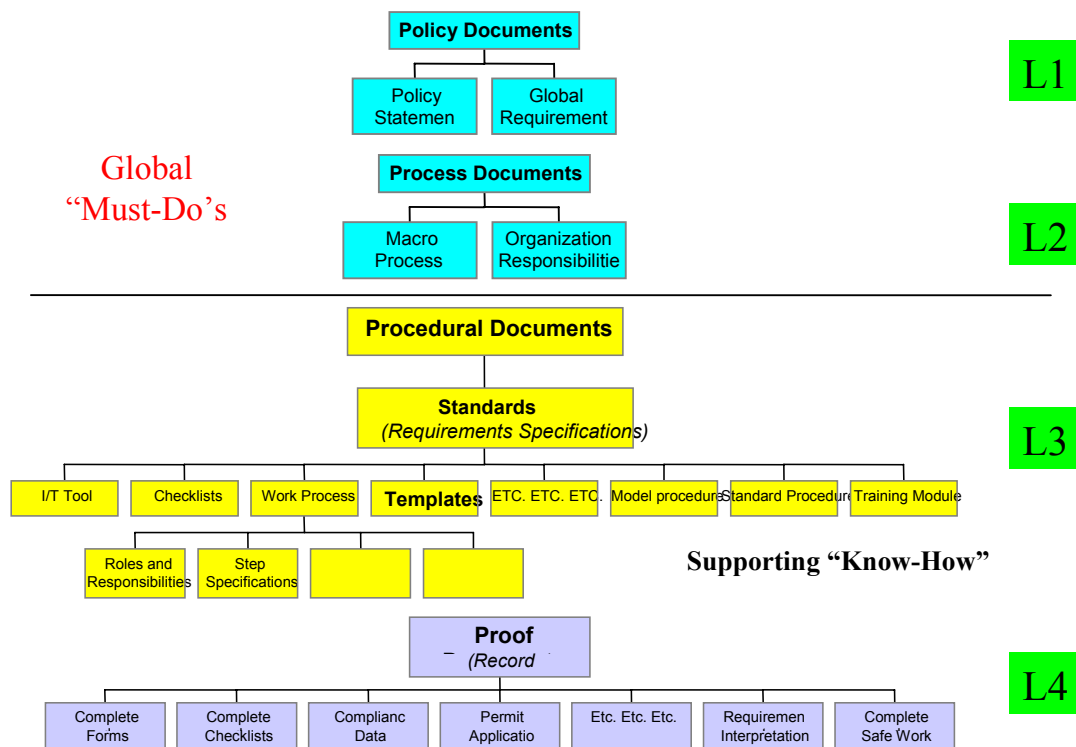
4.1.3. Case Study – Dow's Operating Discipline Management System

Reference Document: Annexure 22 - Case study – Dow's Operating Discipline Management System and its role in achieving results

Having evolved over a period of time, Dow was operating a variety of systems to manage production, quality, responsible care, environment and other functional disciplines. With this mass of multiple management standards there was confusion and dysfunctionality which resulted in major frustration amongst Dow partners and stakeholders. In 2000 it was resolved to integrate all management standards into one integrated Operating Discipline Management System (ODMS).

Applying the PDCA cycle explained above and in *Annexure 20*, the ODMS is structured into 12 sections including governance, common management standards, production, quality, people, procurement, accounting etc. The document hierarchy is reproduced below from Stephen Rose's presentation – see *Annexure 22*:

Document Structure and Document Type



Each document is assigned an “owner” to ensure its appropriateness and relevance to the business. Its value is captured as follows

- One consolidated, integrated, coordinated management system
- Simple and easy to use
- Duplicated work eliminated and global processes, documentation and practices are at the right level
- Well organized Management System with “Common Elements” and areas of focus
- Total system is clear for leaders
- Easy access to best practices
- One common approach especially for customer interface
- Easier to integrate / add other system requirements and to implement

The establishment of 1 complete operating manual for Dow has ensured that all employees “sing off the same hymn sheet” and attend to continuous improvement in their work in a disciplined manner. In particular the ODMS is viewed as a major contributor to the achievement of Safety, Health, Environment and Energy goals.

4.2. PFIZER Inc

Reference Documents:

- *Annexure 23 - Pfizer Green Chemistry Initiatives*
- *Annexure 24 - Risk Assessment Guidelines and Safe Handling and Storage of Hazardous Chemicals*
- *Annexure 25 – UK HSE Guide to Risk Assessment Requirements*
- *Annexure 26 – Developing an Occupational Health Programme*
- *Annexure 27 – Occupational Medical Support*

Pfizer discovers, develops, manufactures, and markets prescription medicines. The company has three business segments: health care, animal health and consumer health care.

Three presentations were as follows:

4.2.1. Green Chemistry

Reference Document: Annexure 23 - Pfizer Green Chemistry Initiatives

Elizabeth Girardi Schoen, Senior Director Environmental Affairs, explained the way in which Pfizer viewed sustainable development and its alignment with Pfizer’s mission, its relationship with corporate citizenship, the role of Environment Health and Safety in corporate citizenship and Green Chemistry as one of the means of reducing environmental footprint and in employee protection.

Pfizer views Corporate Citizenship as fundamental in achieving their goals in sustainable development. Underpinned by their Mission, Vision and Values, their Environment Health and Safety Policy and their “Blue Book of Business Codes of Conduct”, Pfizer’s road to Sustainable Development is founded on 3 pillars, all in sync:

- Economic Viability
 - Dividend
 - Share price
 - Capital growth
 - Competitiveness
 - Efficiency
 - Profitability

- Environmental Integrity
 - Efficient use of resources
 - Minimised harm
 - Climate change
 - Biodiversity
 - Reduce non-product output
 - Carrying capacity
- Social Responsibility
 - Protect employees
 - Competitive benefits
 - Engaging in communities
 - Social cohesion
 - Cultural identity

Pfizer was one of the original signatories to the International Chamber of Commerce Charter on Sustainable Development in 1991. Their Environment, Health and Safety Policy is based on the principles contained in the Charter. Pfizer believes in responsible operations for all their facilities, with the baseline being compliance with the laws of the host country as the very minimum. Application of one standard for all in Pfizer drives their passion of no harm to employees, reducing their environmental footprint and being ambassadors in the communities in which they operate.

An alarming statistic presented is that globally, only some 10% of “what gets put into the pipe” comes out as usable goods and services – the rest is waste. It is this type of realisation that adds impetus to Pfizer’s Green Chemistry initiative.

Based on the 12 principles expounded in the book *Green Chemistry: Theory and Practice* by Paul T Anastas and John C Warne, NY: Oxford University Press 1998, there is a conscious effort to move away from site level activity and end of pipe treatment, to life cycle thinking. This provides for a continuum of Product Discovery, Process Development and Design, Product Manufacture, Product Distribution, Product Use and Product Disposition.

4.2.2. Risk Assessment and Safe Handling and Storage of Hazardous Chemicals

Reference Document: Annexure 24 - Risk Assessment Guidelines and Safe Handling and Storage of Hazardous Chemicals

Tom Poulton, Director Health Safety and Occupational Toxicology, discussed Pfizer standards with particular reference to General Risk Assessment (analogous to ISO 14001), Detailed Guidelines for Specific Hazards (similar to the UK Health and Safety Executive (HSE) Assessment Guide and Management Practices).

The importance of conducting and understanding risk assessments in the handling and storage of hazardous chemicals was stressed and case studies were discussed. Pfizer’s approach to safety is based on the UK HSE risk assessment model. There are 5 steps to risk assessment:

1. Look for the hazards
2. Decide who might be harmed

3. Evaluate the risks and determine if controls are adequate
4. Record the findings
5. Review and revise the assessment, if needed

There are many regulations covering chemical industry risk issues – e.g. Manual Handling, Noise, Asbestos, Lead, Control of Hazardous Substances, Personal Protective Equipment and so on. To assist organisations who have duties under the health and safety law, The HSE has produced a useful “Guide to Risk Assessment Requirements” – see *Annexure 25*. The guide shows how provisions in different regulations are linked.

The UK HSE has published a very useful book “*Formula for Health and Safety – guidance for small and medium sized firms in the chemical industry*”. This valuable publication is available from booksellers at an equivalent price of around UK£9.00 or by mail order from:

HSE Books
 P O Box 1999
 Sudbury
 Suffolk
 CO 10 6FS
 Tel +44 1787 881165
 Fax +44 1787

The book covers the following topics:

- Managing Health and Safety
- Chemical Industry Hazards
 - Fire
 - Explosions
 - Work related ill health
 - Equipment and the workplace
 - Electricity
- Chemical Industry Activities
 - Storing hazardous substances
 - Production
 - Maintenance and modifications to plant and processes
 - The finished product
- Emergencies

A useful HSE enquiry service is available on Tel +44 541 545500. Further useful links to obtain information are:

UK HSE Information: www.hse.gov.uk
 HSE Workers Page: www.hse.gov.uk/workers/index.

Three Case studies were presented – see *Annexure 24* – Storing Hazardous Chemicals; Controlling Chemical Exposures; Managing an Effective and Efficient Medical Surveillance Programme:

Case Study 1: Storing Hazardous Chemicals.

An explosion occurred in a raw material warehouse containing cylinders of chemical substances, seriously injuring 4 employees and damaging a nearby building. No unusual circumstances were observed almost up to the time of the explosion. Approximately 2 minutes before the explosion, smoke was observed from one cylinder. This was followed by searing of the paint on the cylinder, obvious radiant heat and then the explosion.

Subsequent laboratory testing of temperature / pressure relationships revealed that at about 30° C the self heat and exothermic potential gave rise to instant pressure increases which burst the cylinder. Material Safety Data Sheets did not indicate this eventuality.

The incident triggered a global response to identify good practices for storing and handling hazardous materials, evaluate current practices and correct deficiencies. The concept of “full cycle” handling of hazardous chemicals was implemented – i.e. procurement, receiving, storing and transporting on site, together with a Management System (MS) for hazardous materials.

The MS should highlight the different hazard categories – i.e. Special Hazards (infectious substances, radioactive, explosives); Compressed Gasses (flammable, toxic, non-flammable / non-toxic, aerosols); Reactive (self heating / self reactive, pyrophoric / air reactive, water reactive, organic peroxides, oxidisers); Flammable / Toxic (flammable liquids, toxic substances, corrosives, combustible liquids)

The MS should further define a risk assessment procedure. It was emphasised that there is a need for a risk assessment form for every material on site. It is cautioned that information contained on shipping labels is not always applicable to storage. There are also supplementary special safety issues to be considered – temperature, humidity, shelf life, peroxide formation as well as special information pertinent to certain hazard categories.

An important aspect is to provide storage recommendations – isolation (dedicated facilities), segregation (not stored in same compartment), and separation (kept apart by a defined space). In addition specifications must detail positioning of storage area, quantity and height restrictions, fire protection, ventilation, detection, spill control, electrical classification.

Information and storage recommendations are available on the web – e.g.:

- UK Health and Safety Executive Guides
- National Fire Protection Association
- German Chemical Industry (VCI)
- Industrial suppliers (such as Merck Deutsch)
- International Fire Code
- Pfizer Environmental Health and Safety Guidelines

An important lesson is that risks can be addressed by a detailed risk assessment programme and should be a priority action in the chemical industry sector.

Case Study 2 – Controlling Chemical Exposures

The issue faced by Pfizer is that there is no external guidance for occupational exposure to chemicals in the workplace. Often materials have to be handled before clinical tests are complete and there is a need for internal Occupational Exposure Limits (OEL's) and control strategies to be put in place to protect humans exposed to the materials.

A fascinating formula for deriving OEL was shared, which considers the relationships of Pivotal Dose (dose / exposure leading to observable effect), Body Weight, Volume Inspired, Adjustment for Pharmacokinetic Parameters and a Safety Factor. The Safety Factor is derived from a selection of sub-factors which consider the prevalence of the effect (observable / major / minor), the species under study (human / ape / dog / rat), the length of the study, the dose response (judgemental / data available) and the significance of the pivotal finding (reversible / trivial / irreversible / significant).

The OELs of various materials, expressed in terms of mcg/m^3 , are then arranged in a matrix of 5 Occupational Exposure Bands (OEBs) which are categories of risk in orders of magnitude. For each OEB level there is a specified control strategy – e.g.

OEB level 1 ($10\,000\text{ mcg/m}^3$):	General ventilation suffices
OEB level 2 ($1\,000\text{ mcg/m}^3$):	Local exhaust ventilation is required
OEB level 3 (100 mcg/m^3):	Down flow booths through air filters
OEB level 4 (10 mcg/m^3):	Remote operation
OEB level 5 (1 mcg/m^3):	Glove box isolators

It was emphasised that chemical specific exposure limits are difficult to establish and the general control strategies banded to a hazard can provide necessary guidance.

Case Study 3 – Managing an Effective and Efficient Medical Surveillance Programme

Often occupational hygiene and medical programmes operate independently, with insufficient understanding and communication between the professionals. It was contended that physicians need histories to target medical surveillance and hygienists need medical restrictions to accommodate employees.

Typically the elements of the respective programmes are as follows:

- Hygiene programmes
 - perform qualitative assessments
 - perform quantitative assessments
 - implement workplace controls
- Medical programmes
 - conduct medical examinations
 - report findings to employees
 - accommodate medical restrictions

Integrating these fundamentals incorporates the following elements to form a continuum of Medical / Hygiene Surveillance:

- identify individuals at risk based on exposure
- analyse relationship between medical results and occupational exposures

By working together, medical and hygiene professionals can identify individual's risks through:

- Hazard Assessment – effect on health and target organ information

- Exposure Assessment – intensity and duration of exposures through qualitative job and task descriptions and quantitative exposure monitoring data
- Medical Assessment – defined medical protocols

Hazard assessments are compiled into a Health Effect Coding System which details:

- Confidence of the assessment – levels of confidence in the information derived from studies on humans, animals or other sources which indicate probability / possibility of causing harm to health
- Health effect description – indicating effects such as allergies, cancer, toxic, birth defects, irritations and so on
- Target organ description – health impacts on specific organs – heart, liver, eyes, blood etc

For example the health effect code 2HRM.280.796 of a particular material means that, based on animal studies only, it may cause harm with an adverse impact on blood pressure.

Exposure assessments are linked to individual employees and consist of assessments of:

- Tasks – equipment, material, environment, controls
- Exposure monitoring – results
- Exposure history – employee
- Medical history – employee

Assessment tools have been developed and together with medical examinations, questionnaires and tests, recommended examinations and strategies are compiled for each employee together with the frequency of examinations / monitoring. All data is tracked electronically.

In *Annexure 26* an article is reproduced on “Developing an Occupational Health Programme” by Pfizer’s Tom Poulton and Dr George Mellendick. This article deals with the shared responsibilities of Occupational Hygienists and Occupational Physicians and the integration of primary and secondary preventative measures in facilitating the health and safety of employees in the workplace.

4.2.3. Occupational Medical Support

Reference Document: Annexure 27 – Occupational Medical Support

Dr George Mellendick, Occupational Medical Director, presented an overview of the Occupational Medical Support Guideline and the manner in which Pfizer maintains and communicates its database for industrial hygiene and health testing to its Medical Practitioners. This was an extension to Case Study 3 above but with a more medical focus.

At the very outset it is important that statutory regulations are catered for in the guideline – country, state and local authority. At site level the policies and procedures specific to that site must correspond to the relevant section / point in the guideline. This is constantly reviewed for compliance.

The roles and responsibilities of Occupational Health staff are defined to ensure that:

- Risk assessments are performed to Pfizer stated protocols

- A system is in place to ensure that risk assessment data is transmitted to Medical Practitioners
- Information is stored in the medical departments in approved data bases
- Systems are in place to ensure that workplace exposures and hazards are dealt with and closed out effectively
- Combined Occupational Hygiene / Safety / Medical meetings take place regularly
- Occupational Health staff regularly tour their sites
- Occupational Healthy staff are part of the Safety team
- All accidents and incident investigation reports are reviewed to identify patterns or trends

After initial medical support by way of examination of newly hired employees based on their job specific conditions, the ongoing and subsequent medical support includes:

- ensuring that the workforce is categorised into comparably exposed groups – e.g. noise, dust, office, confine space, travellers and other risk assessment categories – and that the frequency and intensity of medical surveillance is carried out
- reviewing that work related complaints and symptoms are attended to and any patterns and trends identified
- ensuring that all cases are handled according to the facilities procedures
- reviewing the “return to work” practices It is a requirement that employees being off work for more that 15 working days due to illness, need to be medically cleared before returning to work
- addressing the issue of “fitness for duty” – e.g. substance abuse, depression

Attention to occupational illness and injury is one of the most crucial sections of the Guideline. In particular, the internal mechanisms for logging the cases accurately and ensuring that appropriate professional medical care, is accessed – especially where there is no designated site physician.

Accurate record keeping is crucial, especially where regulated medical testing is mandated. Complete and accurate lists of all site personnel who fit into a “comparably exposed group” must be available at all times and presented promptly on request.

Site emergency treatment procedures include knowledge of the nearest hospital and other medical and emergency services, the nature of transport systems for the ill and injured, and programmes for First Aiders – their training and recertification must be validated.

Every employee has a medical record which is retained for 30 years after employment. Disposal of records after this time is a deliberate and disciplined action and must be built into the facilities plan.

In order for the Occupational Medical Support Guideline to be effectively implemented, it is a crucial requirement that there is integration between medical, occupational hygiene and safety functions. The foundation of this is being able to demonstrate that every employee is linked with the relevant Risk Assessment.

Ensuring that communication of health and safety information is a key task – especially where trends and patterns necessitate corporate notification to all Pfizer facilities in the world.

4.3. ALCOA Inc

Reference Documents:

- *Annexure 28 - Alcoa's Health and Safety Management System*
- *Annexure 29 – Alcoa's Health Strategies*
- *Annexure 30 – Preventing TB Transmission*
- *Annexure 31 – Alcoa's Global Environmental Strategies*

Alcoa is the leading producer of primary aluminium, fabricated aluminium and alumina. Its products are used worldwide in chemicals, aircraft, automobiles, beverage cans, buildings, sports and recreation, and a variety of industrial and consumer applications. Alcoa is active in all major aspects of the industry, including technology, mining, refining, smelting, fabricating and recycling.

Bob James, Director Worldwide Health discussed Alcoa's Environment Health and Safety strategies, a balanced scorecard method of tracking performance and progress towards achieving goals.

4.3.1. Alcoa's Health and Safety Management System

Reference Document: Annexure 28 - Alcoa's Health and Safety Management System

Aluminium, chemical symbol Al, is a Group IIIA element with a relative density of 2.7 g/ml (about the same as glass and $\frac{1}{3}$ that of Iron). It has a melting point of 660°C and a boiling point of 2450°C . Aluminium is a lightweight silver-coloured metal that can easily be formed into any shape. It does not rust and can resist most weather and many chemical conditions. It is soft and displays poor strength properties and therefore is combined with many other elements to form alloys, which give it the strength and other properties required to make it useful. In the world, aluminium is the 3rd most plentiful metal used after iron and steel.

Aluminium does not exist in its free form but always in a chemical combination with other elements – e.g. Aluminium Silicate. It is the most plentiful element on the earth's crust, making up about 8%, and the most common element after Oxygen and Silicon. Bauxite, the ore richest in aluminium, is found in many locations in the world but is mainly mined in the Caribbean, Australia and Africa.

The process of recovering Aluminium is as follows:

- Mining Bauxite
- Refining Bauxite to Alumina
- Smelting Alumina to Aluminium
- Fabricating Aluminium into useful products
- Recycling

After being mined, the Bauxite ore is refined by being crushed, and mixed with lime and caustic soda and heated in large pressurised vessels. Under these conditions the aluminium components are dissolved in the caustic soda and the resultant solution is recovered from which Aluminium Oxide is precipitated, washed, heated to drive off water and gives rise to a white sugar-like substance called Alumina or Aluminium Oxide (Al_2O_3).

The smelting process converts Alumina into Aluminium by dissolving the Alumina in large cryolite baths, into which a powerful electric current is passed and which results in Aluminium separating from the solution and is siphoned off.

The separated Aluminium is then passed into a furnace where it is mixed with various elements (e.g. copper or zinc and many others) to form the alloy required for a specific product. The mix is fluxed in a molten form and then poured into ingots from which many thousands of products are produced – from beverage cans to jet aircraft.

Alumina chemicals have many other uses – e.g. Aluminium Sulphate is used by most local authorities in the world to purify drinking water.

There is a large incentive to encourage recycling of aluminium products back for re-use. In the USA, of the approximately 100 billion beverage cans produced annually, about $\frac{2}{3}$ are returned for recycling. So is about 85% to 90% of Aluminium used in motor vehicles. From this example, Alcoa contends that everyone wins – as cars use more Aluminium they get lighter, burn less fuel and therefore emit less gas pollution. In addition recycled Aluminium requires less energy than when recovered for raw bauxite ore and there is less solid waste to dispose of.

It is interesting to note that average motor vehicle are made of some 22 different “aluminium components”, which include engine components, wheels, suspension components, electrical components, brackets, yokes, inner door panels and many more.

Considering the vast spectrum and complexity of activities being carried out in Alcoa facilities – from mining, chemical processing, energy generation and consumption, fabrication, waste disposal and land rehabilitation - it is clear that their passion for Safety Health and Environment Management is a core focus. They have embarked on a major mission of introducing far reaching and aggressive goals and targets and an impressive measuring and reporting system.

Alcoa's 2020 Vision for Safety, Health and Environment performance is Zero. They have introduced:

- Balanced Scorecard approach to planning and control
- A well developed and detailed Health and Safety Management System
- Enabling Systems - standards, incident management, reporting
- Information Sharing - fatality prevention database, regional forums, global conferencing
- Technology transfer – best practices, identifying high risk areas,

The Strategic milestones include:

- Zero fatalities
- Zero lost work day injuries
- Zero incidents
- Deployment of risk management and reduction programmes to eliminate causes of injuries

In 2002, Alcoa was recognised as one of America's Safest Companies, along with 16 other companies which included Dow Chemical.

In their quest for an incident-free workplace Alcoa's Health and Safety Model contains the following elements which are further broken down to specific Value, Policy and Principle statements and specific procedures, standards, measurable and reporting requirements. A disciplined and in-depth self audit system is practiced on all elements and sub-elements:

1. Commitment
2. Organisation
3. Communications
4. Incident Management
5. Hazard Control Process - Safety
6. Hazard Control Process – Health
7. Work Practice Controls
8. Training
9. Measurement

Alcoa sees its strength as:

- Placing Safety and Health as a Core Value
- Displaying Strong Management Commitment
- Placing High Expectations on Staff and Demanding Conformance
- Entrenching Strong Standards and an Auditing Process

A goal for the future includes Improving the Way to Work and addressing

- Human error
- Productivity
- Hand injuries
- Ergonomics

Alcoa's Health Strategies – Annexure 29

In line with Alcoa's other thrusts there is a strong commitment to

- eliminate all occupational illnesses and injuries
- ensure safe and reliable products
- integrate Health and Safety functions with Manufacturing
- ensure a healthy workforce
- place Health and Safety as a core value
- increase transparency and community collaboration

The Strategic Milestones are Zero occupational diseases and illnesses and the methodologies include extensive application of metrics in a Balanced Scorecard approach, and the application of a well develop and detailed Health and Safety Management System and providing enablers through:

- a well defined system of metrics

- standards that are credible, achievable, widely known and practiced
- partnerships with external professionals in the Occupational Health field

Extensive use is made of a Balanced Scorecard Approach to planning and control. An example is reproduced below to assist in appreciating the concept:

HEALTH	Target condition
<p><u>Goal</u></p> <p>Zero work related illnesses / injuries and improved health well-being</p>	<ul style="list-style-type: none"> • Metric #5 Health data* <ul style="list-style-type: none"> – 100% of employee health exposures have been assessed (qualitative) by ---- – >95% of employee health exposures have been adequately measured (quantitative) by ---- – >40% reduction in noise / number for the 10 highest unacceptable noise job classifications by --- – >40% reduction in the number / magnitude of unacceptable employee chemical agent exposures by ---- – 100% of locations have an established occupational medicine programme by ---- – 100% of required medical exams** are completed annually – 50% reduction in Location identified top-ten ergonomic risks by ---- • Assessments* <ul style="list-style-type: none"> – All existing locations with “good” audit / self assessment scores on ergonomics (using new audit criteria) by ---- – Formalised EHS self assessment process in place at each location by ---- • Life*** <ul style="list-style-type: none"> – At least 2 focussed health promotion activities established based on health risk factors at each location – Employee Assistance type services established in all locations – At least 1 health initiative established as part of Alcoa's Community Framework by -- -- • Health Compliance <ul style="list-style-type: none"> – New locations complete a gap analysis and develop action plans to meet World Wide Health Standards (WWHS) requirements within 1 year of acquisition – <i>Compliance with laws and regulations is an EHS Principle. All non-compliance situations should be aggressively self-identified and addressed. This requires an</i>

	<p><i>ongoing regulatory gap analysis and corrective action plan</i></p> <hr/> <p>* New locations are expected to meet these target conditions within 3 years on acquisition</p> <p>** Fitness for duty (MEO, respirator), heat, audiograms, chemical specific exams</p> <p>*** New locations are expected to meet these target conditions within 1 year of acquisition</p>
<p>Current Conditions</p> <ul style="list-style-type: none"> • Metric #5 Health data <ul style="list-style-type: none"> – 91% IH qualitative exposure assessments completed – 63% IH quantitative exposure assessments completed – 9% reduction in noise dose for the top10 highest noise job classifications – 35% reduction in number / magnitude of unacceptable employee chemical exposures – 83% of occupational medicine programmes established – 98% completion of required medical exams – 30% to 50% of LWD cases are ergonomically related (all Alcoa 2000) – 15 heat-related incidents in 2001 – 49% of ergonomic top10 risks identified – 14% of identified top10 ergonomic risks eliminated • Assessments <ul style="list-style-type: none"> – 30% of all locations with good or better on ergonomic section of corporate audit (based on old criteria) • Life <ul style="list-style-type: none"> – 26% of all locations report that Employee Assistance service is in place – Life initiative being deployed worldwide • Global metrics data for 2001 except where noted. Excludes 2000 / 2001 acquisitions 	<p>Action Plan Enablers*</p> <ul style="list-style-type: none"> • Location EHS integration with APS • Technology transfer to eliminate unacceptable health risks • Computerised MSDS programme • Hygenius and Hygenius Q • Occupational Health Computer System – e.g. OHM • Alcoa self assessment process • Health standards web page • Metric #5 outputs • Alcoa Health Strategy • Life initiatives / programmes including analysis of location specific health risk factors (examples high blood pressure, obesity, cholesterol, smoking cessation, etc) • Alcoa Community Framework • Ergonomic website and training <hr/> <p>* Enablers to help you move from your current to target condition.</p>

Thrusts for 2004 / 2005 include

- Targeted root cause interventions to address primary, secondary, tertiary health condition management

- Assess impact of medical costs and absenteeism
- Introduce smoking cessation programmes
- Introduce Flu vaccination programmes
- Introduce Health Product safety programmes
- Access / develop commercial MSDS and Product labels
- Address Machine Safety and Design

The extensive use of metrics which is an entrenched part of Alcoa's culture is impressive and clearly leads to their performance as world-class players on the Health and Safety arena.

4.3.2. Preventing TB Transmission

Reference Document: Annexure 30 – Preventing TB Transmission

Bob James shared an interesting document on “Controlling Tuberculosis Transmission with Ultraviolet Irradiation” – see *Annexure 30*. The article explains that Tuberculosis is the leading cause worldwide, in the adult fatality rate, from a single infectious agent. Prevalence appears to be where people are associated in concentrations such as prisons, commercial aircraft, healthcare clinics, schools. Preventative methods to combat transmission include air filtration, air dilution and ultraviolet germicidal irradiation (UVGI). This latter preventative method seems to be a relatively inexpensive method of combating the transmission of the disease. The document in *Annexure 30* contains useful information on the UVGI methodology.

4.3.3. Alcoa's Global Environmental Strategies

Reference Document: Annexure 31 – Alcoa's Global Environmental Strategies

The basis of the environmental strategy is founded on respect for neighbours and the generations that will follow. Alcoa's ideal state of 2020 vision is based on 3 key principles:

- Economic
 - Elimination of all waste
 - Products designed for the environment
- Environment
 - Integration of environment with manufacturing
 - Incident-free workplace
- Social Responsibility
 - Reputation
 - Environment as core value

An aggressive environmental plan seeks to reduce waste as follows:

➤ Sulphur Dioxide	:	75% by 2010
➤ Nitrogen Oxides	:	30% by 2007
➤ Volatile Organic Compounds	:	50% by 2008
➤ Mercury	:	80% by 2008
➤ Greenhouse Gasses	:	50% by 2010
➤ Solid Waste	:	50% by 2007

- Process Water Use : 60% by 2008
- Storm Water Discharge : near zero by 2015

With waste management and energy conservation as a primary goal, Alcoa aims to achieve annual cost reductions of US\$ 100 million and believes that much more is possible. In desiring to be the “best company in the world”, Alcoa demands of its Business Units to be the “best in the communities in which they operate”. Fundamental to this achievement is:

- ✓ engaging employees to use their creativity and innovation
- ✓ abandoning the old “business as usual” approach of end-of-pipe solutions
- ✓ using the full power of ABS principles
- ✓ interaction with communities, regulatory authorities and non-government organisations

The keystone in this strategy combines metrics and commitment to progress measurement, extensive reporting, and business plans that are living documents that can be continuously improved upon.

4.4. ENVIRONMENTAL DEFENCE

Reference Documents:

- *Annexure 32 – Comments to the European Commission on the REACH Proposal (Registration, Evaluation, Authorisation and Restrictions of Chemicals)*
- *Annexure 33 – Paper to the Harvard Business School on Environmental Defence on Remaining Dynamic and Vital*
- *Annexure 34 – Brochure on Partnerships*
- *Annexure 35 – Solutions (Environmental Defence newsletter Sept / Oct 2003)*

Environmental Defence, a non-profit, non-partisan organisation, is one of the USA's most influential environmental advocacy groups. It arguably helped launch the modern environmental movement by winning a ban on the pesticide DDT, thus showing how a small core of concerned individuals can use science and the law to bring about national reform. Guided by science, Environmental Defence evaluates environmental problems and works to create and advocate solutions that win lasting political, economic and social support.

The meeting with Marcia Aronoff, Vice President for Programmes took the form of a discussion about Environmental Defence activities and there was no formal presentation.

Environmental Defence represents some 300 000 members. It receives less than 1% of its funding from corporate donors. For example it accepted no payments from corporate partners such as McDonalds and Fedex in progressing innovative solutions to environmental nuisances. Instead it relies on the generosity of individuals and foundations in its partnership work, to ensure its independence and public credibility.

One of the great concerns is the lack of information regarding an inventory of chemicals that could have an adverse impact on human health. There are suspicions that some 70% or more, of “big selling” chemicals are not tested for impact on human health. There is no requirement for testing of this nature to be conducted. Environmental Defence plays a watchdog role and encourages the cooperation of “like-producers” to engage in testing protocols.

Environmental Defence provides an internet information service called “Scorecard” - www.scorecard.org. In this website there is valuable information on:

- the location of pollutants in various communities
- report on air, land and water contamination
- rankings of pollutants by area / community and by the organisations allegedly responsible
- environmental burden felt by racial / ethnic / economic sectors of the country
- inventories of chemicals that have been tested
- health effects that could be related to specific chemicals
- regulations governing chemical manufacture and use
- prioritising environmental problems in various communities
- assistance with community action to address “toxic” issues

In addition there are interesting articles dealing with environmental issues and a useful section on Frequently Asked Questions.

Gleaned from the website was the following interesting statistic. In the USA, only 8 chemicals account for 99% of estimated cancer risks. One pollutant – diesel emissions – accounts for almost 80% of the estimated lifetime cancer risk associated with outdoor hazardous air pollutant exposures.

Environmental Defence seeks to bridge the gap between “Activism” which is sometimes a move sparked by deep fear and frustration, and “Partnership”, a way of reaching goals that are mutual beneficial to all parties. On the staff are scientists, economists and attorneys, but in addition extensive use is made of academics in institutions involved in the “Green Chemistry” initiatives. They are always wary of dealing with individuals in organisations from which Environmental Defence receives funding. Environmental Defence engages 2 people to focus on lobbying in Washington. Members of the Board are “high powered” and often ease the path to advancement.

Environmental Defence seeks to work together rather than to confront. A fundamental ingredient in working with organisations is buy-in from the top and the assurance that Environmental Defence’s investment in time, brings about an acceptable and useable solution. Results are widely disseminated, this being part of the partnership agreements.

Environmental Defence is to be complemented on the manner in which they appear to balance the many good efforts of the chemical industry with the impacts on human health and human rights.

CHEMICAL INDUSTRIES EDUCATION AND TRAINING AUTHORITY

Paper on USAID Study Tour on Safety, Health and Environmental Issues

Executive Summary

In order to address the high likelihood of underdeveloped safety, health, environmental and energy efficient policies, standards and practices in the Chemicals sector (particularly amongst the small industries comprising some 70% of the sector), the CHIETA wishes to undertake a study tour to the US. USAID have offered to sponsor 10 participants on such a study tour to visit selected agencies and organisations.

The main objectives of the tour will be to:

1. Expose participants to industry best practices for handling chemicals in a safe and environmentally appropriate manner
2. Identify procedures to reduce the negative impact on the environment from careless handling of chemicals, with special attention to Responsible Care Initiatives
3. Prepare for follow-up professional development activities within the sector, incorporating said best practices, via exposure to model training programmes

The intended deliverable upon returning home will be the development of a national policy and standards on Safety, Health and Environment, and incorporation into skills development programmes and learnerships in the Chemicals sector.

The Governing Board has approved the following composition of the study tour.

- 2 Private Sector representatives with a special interest, knowledge, experience and involvement in Safety, Health and Environment matters
- 3 Organised Labour Representatives with a special interest, knowledge, experience and involvement in Safety, Health and Environment matters
- 1 SGB / Chamber Specialist who is active in unit standards writing and conversant with all the Chamber issues
- The CHIETA Operations Manager (Acting CEO) to lead the tour and who is also experienced in the theory and practise of SHE in the Chemicals sector and is considered a "subject matter specialist".
- 1 Staff member who is well versed and active in Learnership development in the FET and HET bands
- 1 Staff member who is well versed and active in ETQA methodologies and practice
- 1 Staff member who has been active in the development and practical implementation of education and training programmes in the Chemicals sector

Training in the USA is planned between 14 September 2003 and 29 September 2003. Travel arrangements will be advised to cater for this.

Background

Maurice Strong, Secretary General of the 1992 UNCED (the Rio de Janeiro Earth Summit) once said, *“Industry is the principle instrument of economic growth; it is also the prime instrument of environmental and social change”*. This puts a special responsibility on the shoulder of industry.

The International Chamber of Commerce Charter on Sustainable Development (adopted in November 1990) has 3 critical aims:

1. To stimulate enterprises to commit themselves to continued improvement in their environmental performance
2. To provide common guidance on environmental management to all types of businesses around the world, and to aid them in developing their own policies and programmes
3. To demonstrate to governments and society that business is taking its environmental responsibilities seriously by helping to reduce the pressures on governments to over-legislate thereby strengthening the voice of business in policy debates

The Chemical industries sector converts basic raw materials into valuable products for consumers and other industries. These products improve the living standards and help to protect the environment, yet the industry attracts considerable criticism and controversy. Chemical processes have the potential to create a better life for all, but at the same time the potential to seriously pollute the air and our water resources, to generate waste that is of nuisance value and possibly hazardous and to squander energy.

In South Africa there are over 3000 companies registered to the CHIETA, employing some 120 000 workers. Of these companies, about 70% are classified as “small” (less than 50 people), where there is a high likelihood of underdeveloped safety, health, environmental and energy efficient policies, standards and practices. It is possible that in some companies in the “medium” and even “large” categories a similar situation exists.

Recognising this potential problem, the CHIETA accepts the responsibility to develop a national policy and standards for the Chemical industries sector dealing with global climate change, safety, health and environmental impacts of chemical operations, and energy efficiency. In particular, there is a dire need to understand and accept the concept of “responsible care” and “best practices” relevant to the chemical industry.

The intention is to create unit standards and qualifications in Safety, Health and Environmental matters. The intention is to develop these for every Learnership, including the Higher Education and Training band, and possibly relevant skills programmes. The application of these Learnerships and programmes will then devolve to training providers and employers to implement. The purpose of the tour is the preparation for development of the policy and standards – not the implementation phase in the workplace.

USAID has agreed to fund 10 tour participants to visit selected agencies and organisations in the USA. Ideally the bulk of the tour participants should be CHIETA staff, accompanied by selected stakeholder representatives who could interact with specialists in the USA and who have a special interest, knowledge, experience and involvement in Safety, Health and Environment matters. This would fast track the objectives of creating the policies, standards and commitments to equip learners, providers and employers for the crucial task of sustainable development.

Objectives of a 2-week Study Tour

1. Expose participants to industry best practices for handling chemicals in a safe and environmentally appropriate manner
2. Identify procedures to reduce the negative impact on the environment from careless handling of chemicals, with special attention to Responsible Care Initiatives
3. Prepare for follow-up professional development activities within the sector, incorporating said best practices, via exposure to model training programmes

Remit of Tour Participants

It is incumbent upon participants to demonstrate their commitment to the training programmes and to be accountable for delivering results. It would be improper to treat the tour as a sight-seeing or shopping event. The opportunity to engage with international experts is a privilege not often encountered in the sector.

Participants must be aware of and accept the following:

- Agree to the general and specific objectives of the study tour
- Create individual / personal objectives that are aligned with and contribute to the overall objectives of the tour
- Take an active role in the tour which includes taking turns in leadership roles, devising questions for hosts, helping to lead post-visit discussions and debriefings, compiling portfolios of evidence, report writing
- Work as a team and help facilitate achievement of a common agenda for the whole group
- Individually and collectively carry responsibility for the group's performance
- Agree to a specific, concrete commitment to the CHIETA upon return, based on the objectives of the study tour
- Develop a "product" by gathering information in a specifically allocated area of interest, and imparting it by way of presentations and reports, with suggestions and recommendations for implementation
- Compile a report on the study tour
- Actively contribute to the compilation of the policies, standards and qualifications for the Learnerships

Pre-requisites for Participants

The selection of participants is crucial to achieving the objectives. The following is ideally required:

- An interest in and preferably an experienced practitioner in Safety, Health and Environmental issues
- Technically knowledgeable of the chemical industries sector generally
- Understanding of the technology and learning across all levels (FET & HET)
- Ability to impart knowledge gained by means of presentations and written material
- Availability to join working groups in developing the policies, standards and training programmes

USAID Requirements of Participants

Participants will be required to:

- Complete biographical data forms
- Sign a "Conditions of Training" form which commits to adherence to the training programme, conformance to USAID regulations and beneficial transfer of knowledge gained when returning home
- Apply for a Visa (process takes 12 weeks) after approval of nominated candidate by USAID
- Complete a Medical release statement which requires declaration of pre-existing medical conditions. If such medical conditions exist, then enhanced Medical Insurance is required. For training periods less than 30 days, no medical certificate is required.

Participants

The Governing Board has determined that the tour group is composed as follows:

- 2 Private Sector representatives with a special interest, knowledge, experience and involvement in Safety, Health and Environment matters
- 3 Organised Labour Representatives with a special interest, knowledge, experience and involvement in Safety, Health and Environment matters
- 1 SGB / Chamber Specialist
- 1 Staff member who is well versed and active in Learnership development in the FET and HET bands
- 1 Staff member who is well versed and active in ETQA methodologies and practice
- 1 Staff member who has been active in the development and practical implementation of education and training programmes in the Chemicals sector
- The CHIETA Operations Manager (Acting CEO) to lead the tour and who is also experienced in the theory and practise of SHE in the Chemicals sector

Stakeholders have advised that their nominees are as follows

Private Sector

- Judy Pitts (Huntsman Tioxide)
- Johan Coomans (SASOL Synfuels)

Organised Labour

- Pelelo Magane (CEPPWAWU)
- Masindi Mavhivha (SACWU)
- Gerhard Ceronie (Solidarity)

CHIETA

- Len Larson (Operations Manager / Acting CEO)
- Janina Martin (Assistant Manager Skills Planning and Learnerships)
- Tshidi Magonare (Project Specialist ETQA)
- Bubba Naidoo (Regional Officer KZN)
- David Duke (Chamber / Standards Generating Body Specialist)

Len Larson
Operations Manager
11 June 2003



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USAid STUDY TOUR – PARTICIPANT DETAILS

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lel 19 June 2003

*Environment, Health & Safety Study Tour
for CHIEA and Representatives of the Chemical Industries
in the Republic of South Africa*

September 15-29, 2003

SCHEDULE

MONDAY, SEPTEMBER 15

12h15 Arrive Reagan National Airport on Delta #1442
Sue Rollins, Study Tour Coordinator, Development Associates, will meet group at baggage claim for transport to Key Bridge Marriott, 1401 Lee Highway, Arlington, VA, tel: (703) 524-6400

TUESDAY, SEPTEMBER 16

9h00 Orientation with Sue Rollins and Dr. Gilbert Jackson of USAID, Jackson Room (3rd floor)
A light continental breakfast will be provided.

12h00 Break for lunch

14h00 Meet in hotel lobby for 4-hour tour of Washington, DC (optional)

WEDNESDAY, SEPTEMBER 17

8h00 Depart from hotel lobby

9h00 National Institute of Standards and Technology (NIST), 100 Bureau Drive, Gaithersburg, MD, tel: (301) 975-2386

11h00 Depart

12h00 Lunch and Briefing at George Meany Center for Labor Studies, 10000 New Hampshire Avenue, Silver Spring, MD, tel: (301) 431-6400

13h00 Chemical Handling Training conducted by the PACE (Paper, Allied Industrial, Chemical and Energy Workers) International Union

17h00 Return to Marriott Key Bridge

19h00 Group Discussion/De-briefing, Georgetown C Room (Lower Level) (until 20h00)

THURSDAY, SEPTEMBER 18

8h00 Depart from hotel lobby

8h30 U.S. Environmental Protection Agency (EPA), Ronald Reagan International Trade Center, 1300 Pennsylvania Ave., NW, 3rd Floor Conference Rooms 1 & 2, Washington, DC, tel: (202) 564-6617

11h45 Break for lunch

13h00 Meeting continues

17h30 Return to Key Bridge Marriott

FRIDAY, SEPTEMBER 19

8h30 Depart from hotel lobby

9h00 National Association of Chemical Distributors (NACD)/Chemical Educational Foundation (CEF), 1560 Wilson Blvd., Suite 1250, Arlington, VA, tel: (703) 527-6223

11h00 Return to Key Bridge Marriott and break for lunch

12h30 Depart from hotel lobby

13h00 Synthetic Organic Chemical Manufacturers Association (SOCMA), 1850 M St., NW, Suite 700, Washington, DC, tel: (202) 721-4100

15h00 Depart for Development Associates offices for Group Discussion/De-briefing (until 17h30)

SATURDAY, SEPTEMBER 20

Free

SUNDAY, SEPTEMBER 21

- 13h00 Hotel check-out and depart for Wilmington, DE
- 16h00 Arrival in Wilmington and check in at Courtyard by Marriott-Wilmington Downtown, 1102 West Street, Wilmington, DE, tel: (302) 773-0966

MONDAY, SEPTEMBER 22

- 9h15 Depart from hotel lobby
- 9h30 DuPont Company, 1007 Market Street, Room D-6076, Wilmington, DE, tel: (302) 773-0966
- 11h45 Break for lunch
- 12h45 Meeting continues
- 15h00 Return to Marriott-Wilmington
- 19h00 Group Discussion/De-briefing in Andrew Wyeth Room (until 20h00)

TUESDAY, SEPTEMBER 23

- 12h00 Hotel check-out and depart for New York City
- 15h00 Arrive in New York City and begin 3-hour city tour
- 18h00 Check in at Crowne Plaza at the United Nations, 304 East 42nd Street, New York, NY, tel: (212) 986-8800

WEDNESDAY, SEPTEMBER 24

Today's meeting was arranged by the World Environment Center (WEC).

- 9h45 Depart from hotel lobby
- 10h00 Meet with representative of The Dow Chemical Company at Pfizer Inc., 235 East 42nd Street, Room 40, New York, NY, tel: (212) 573-1000
- 12h00 Working Lunch with representatives from Dow and WEC

- 14h00 Meeting continues
- 16h00 Return to Crowne Plaza

- 17h00 Group Discussion/De-briefing, Regency Lounge

THURSDAY, SEPTEMBER 25

Today's meetings were arranged by the World Environment Center (WEC).

- 8h45 Depart from hotel lobby
- 9h00 Meet with Pfizer staff at Pfizer offices
- 12h00 Break for lunch
- 13h30 Meet with representative of Alcoa Inc. at Pfizer offices
- 15h30 Return to Crowne Plaza for Group Discussion/De-briefing, Regency Lounge (until 16h30)

FRIDAY, SEPTEMBER 26

- 9h30 Depart from hotel lobby
- 10h00 Environmental Defense, 257 Park Avenue South, 17th Floor, New York, NY, tel: (212) 505-2100
- 11h00 Return to Crowne Plaza
- 11h30 Wrap-up and Evaluation, Regency Lounge (until 12h30)
Please return your completed evaluation form at this meeting.

SATURDAY, SEPTEMBER 27

Free

SUNDAY, SEPTEMBER 28

Free

MONDAY, SEPTEMBER 29

- 14h00 Hotel check-out and depart for JFK International Airport for return home on Delta #7796 at 17h55

<i>WEDNESDAY, SEPTEMBER 17</i>

9h00 – 11h00**National Institute of Standards and Technology (NIST)**

100 Bureau Drive, Gaithersburg, Maryland

tel: (301) 975-2386

website: www.nist.gov**Overview:**

NIST is a non-regulatory federal agency within the U.S. Commerce Department's Technology Administration. NIST's mission is to develop and promote measurement, standards and technology to enhance productivity, facilitate trade and improve the quality of life. The Office of International Affairs, among other functions, provides advice on international science and technology affairs and arranges for NIST services to users in friendly countries. The Chemical Science and Technology Laboratory conducts research in measurement science and develops the chemical, biochemical and chemical engineering measurements, data, models and reference standards that are used to improve public health, safety and environmental quality.

Agenda:

Dr. Claire M. Saundry, Chief, International Affairs, Office of International Affairs

Welcome/Overview of NIST

Dr. William F. Koch, Acting Director, Chemical Science and Technology Laboratory

Description of Lab Activities

12h00 – 17h00**Chemical Handling Training at George Meany Center for Labor Studies**

10000 New Hampshire Avenue, Silver Spring, Maryland

tel: (301) 431-6400

websites: www.niehs.nih.gov/wetp, www.wetp.org**Overview:**

The Worker Education and Training Program (WETP) is a federally funded program administered by the National Institute of Environmental Health Sciences (NIEHS). WETP supports the training and education of workers engaged in activities related to hazardous materials and waste generation, removal, containment, transportation and emergency response. NIEHS has contracted out to community-based non-profit organizations throughout the United States who have a demonstrated track record in providing high quality occupational safety and health education to implement the WETP. Among these grantees is the PACE (Paper, Allied

Industrial, Chemical and Energy Workers) International Union. PACE is offering a refresher course in the handling of chemicals to two of its member organizations, and the South African delegation has been invited to participate in the training.

Prior to the training, the delegation will join Bruce Lippy of MDB, Inc. for lunch. As Director of the National Clearinghouse for Worker Safety and Health Training for NIEHS, Mr. Lippy compiles the training materials from 18 grantee organizations and makes them available through a webpage. Mr. Lippy will brief the delegation on the WETP and the training activity.

Trainers: Doug Stephens, Coordinator, Grant Health and Safety Field Operations, PACE
Gary Morris, PACE worker trainer
Tim Chisom, PACE worker trainer

Participants: Just Transition Alliance (JTA)
JTA is a national minority NGO comprised of the Asian Pacific Environmental Network, Southwest Network for Environmental and Economic Justice and the Indigenous People's Network. PACE and JTA are partnering in efforts to find ways to understand each other's perspective on the issue of plant closures versus the adverse environmental impacts on the neighborhoods surrounding the plants.

Dr. Jenice View, Executive Director
Jose Bravo, Training Coordinator

Center for Health, Environment and Justice (CHEJ)
CHEJ seeks to help local citizens and organizations come together to take a stand in order to hold industry accountable and work towards a healthy, sustainable future.

Steven Lester, Science Director
Barbara Sullivan
Danielle Asselin

Training Agenda:

13h00 Introductions

13h10 Activity on Systems of Safety

This activity introduces a systematic approach to addressing health and safety issues within the workplace. It is designed to offer an

alternative way of viewing incidents by finding real root causes rather than just assuming that a worker's behavior caused that incident.

14h10 Activity – Name That Chemical

This activity is an exercise on Chemical Resource Information that gets everyone on their feet and participating.

15h30 Lessons Learned

Taken from a systems-based incident investigation of an actual incident, this lesson learned shares the information gleaned from a chemical release which resulted in the deaths of three employees.

16h45 Closing Comments

17h00 Conclusion

THURSDAY, SEPTEMBER 18

8h30 – 17h30

U.S. Environmental Protection Agency (EPA)

Ronald Reagan International Trade Center, 1300 Pennsylvania Ave., NW, Third Floor Conference Rooms 1 & 2, Washington, DC
tel: (202) 564-6617
website: www.epa.gov

Overview:

A federal agency, EPA develops and enforces regulations that implement environmental laws enacted by the U.S. Congress. EPA is responsible for researching and setting national standards for a variety of environmental programs and delegates to states and tribes the responsibility for issuing permits and for monitoring and enforcing compliance. EPA also currently sponsors voluntary partnerships and programs with industries, NGOs and state and local governments on over 40 voluntary pollution prevention programs and energy conservation efforts.

Agenda:

- | | |
|-------|--|
| 8h30 | Diana Gearhart, International Visitors Coordinator, Office of International Activities, to meet delegation in EPA Lobby |
| 9h00 | Jeuli Bartenstein, Senior Management Analyst, Office of Organization and Management Consulting Services, Office of Administration and Resources
<i>Overview of EPA, EPA's State/Local Relations</i> |
| 10h00 | Marianne Bailey, Program Manager for Africa, Office of Western Hemisphere and Bilateral Affairs, Office of International Affairs
<i>EPA's Africa Projects</i> |
| 10h30 | TBD
<i>Chemicals in Our Community: High Production Volume (HPV) Chemical Challenge Initiative</i>
<i>Chemical Right-to-Know Initiative (focus on children)</i> |
| 11h45 | Break for lunch |
| 13h00 | Tracy Williamson, Acting Chief, Industrial Chemistry Branch, Office of Pollution Prevention and Toxics, Office of Prevention, Pesticides and Toxics
<i>Green Chemistry – Promoting Pollution Prevention</i> |

- 13h45 Nhan Nguyen, Chief, Chemical Engineering Branch, Economics, Exposure and Technology Division, Office of Pollution Prevention and Toxics, Office of Prevention, Pesticides and Toxics
Green Engineering and Voluntary Partnerships
- 14h30 Clive Davies, Economics, Exposure and Technology Division, Office of Pollution Prevention and Toxics, Office of Prevention, Pesticides and Toxics
Promoting Safer Chemicals, Risk Reduction and Public Understanding of Risks
- 15h30 Break
- 15h45 Telephonic Meeting with Cincinnati, Ohio office
Overview of Microbiological and Chemical Exposure Assessment Research (how hazardous materials are transported, measurement of human risk factors)
Integrated Risk Information System (IRIS)
- 16h45 Richard Emory, Senior Attorney Advisor, International Enforcement and Compliance Division, Office of Enforcement and Compliance Assurance
Enforcement and Compliance with Chemical Companies
- 17h30 Adjourn

FRIDAY, SEPTEMBER 19

9h00 – 11h00

**National Association of Chemical Distributors (NACD)
Chemical Educational Foundation (CEF)**

1560 Wilson Blvd., Suite 1250, Arlington, Virginia
tel: (703) 527-6223
website: www.nacd.com

Overview:

NACD is an international trade association representing chemical distributors, typically small businesses. A condition of membership is a signed commitment to the NACD Responsible Distribution Process (RDP) as well as verification of members' RDP policies and procedures by a third-party firm.

CEF was originally founded to establish a chemical product stewardship network to disseminate information to the NACD distributor members' customers and their communities. The scope of the Foundation eventually evolved so that CEF now serves the chemical industries as a whole. CEF educates suppliers, distributors, customers and the general public, especially children, about the safe handling of chemicals.

Agenda:

Bill Allmond, Director of Regulatory Affairs, NACD
Responsible Distribution Process (RDP)
Third-Party Verification
Site Class Verification, a Joint Program of NACD and Chemical Manufacturers

John Rice, Director, CEF
Educational Outreach Programs (focus on industry)

13h00 – 15h00

Synthetic Organic Chemical Manufacturers Association (SOCMA)

1850 M St, NW, Suite 700, Washington, DC
tel: (202) 721-4100
website: www.socma.com

Overview:

SOCMA is a trade association serving the specialty-batch and custom chemical industry. SOCMA is the voice of companies that are small to medium in size, as defined by the U.S. Small Business Administration. As a trade association that represents a unique sector of the chemical industry, SOCMA often has a different perspective on issues than other chemical manufacturing trade associations.

SOCMA's Association Management Center is a full-service resource center for managing chemical and related industry associations.

Agenda:

Greg Smith, Responsible Care Manager
Recent Developments in Responsible Care

Ed Kordoski, Executive Director, Association Management Center
SOCMA's Involvement in the High Production Volume (HPV) Chemical Challenge Initiative

MONDAY, SEPTEMBER 22

9h30 – 15h00

DuPont Company

1007 Market Street, Room D-6076, Wilmington, Delaware

tel: (302) 773-0966

website: www.dupont.com

Overview:

Founded in 1802 as an explosives company, DuPont today is a science and technology company that works in a wide range of areas including food and nutrition, health care, apparel, safety and security, construction, electronics and transportation. Strengths in polymer science and chemistry built the modern DuPont, and the company continues to broaden its traditional technical platforms in chemistry and materials science through applied research in biotechnology.

Agenda:

- | | |
|-------|--|
| 9h30 | Aldo Morell, Director, Safety, Health and Environment (SHE) Excellence Center
<i>Introductions, Safety Orientation</i> |
| 9h45 | M. Deak, Director, Corporate Safety
<i>Overview of DuPont SHE Philosophy</i> |
| 10h45 | Break |
| 11h00 | Judy Passwater, Six Sigma Champion for DuPont Global Services
<i>Overview of Six Sigma Program (a business management process that concentrates on eliminating defects from work processes)</i> |
| 11h45 | Lunch |
| 12h45 | Aldo Morell
<i>Progress Towards Achievement of Environment and Energy Goals</i> |
| 13h15 | Mack McFarland, atmospheric scientist/climate change
<i>DuPont's Participation in Climate Change Studies</i> |
| 14h00 | Emeko Nwanko, researcher working on new business in developing economies using Six Sigma
<i>New Business in Developing Economies</i> |
| 15h00 | Adjourn |

WEDNESDAY, SEPTEMBER 24

Today's meeting was arranged by the World Environment Center (WEC), an independent non-profit organization that works to advance sustainable development by encouraging environmental leadership, helping to improve health and safety practices worldwide, and fostering the efficient use of natural resources to protect the environment.

10h00 – 16h00 Meeting with representative from The Dow Chemical Company at Pfizer Inc. World Headquarters

235 East 42nd Street, Room 40, New York, New York

tel: (212) 573-1000

Dow website: www.dow.com

WEC website: www.wec.org

Overview: Dow is a science and technology company that provides chemical, plastic and agricultural products and services to a wide range of markets including food, transportation, health and medicine, personal and home care, and building and construction.

Agenda: Stephen Rose, Director of Dow's Responsible Care and Operating Discipline Management System, Global EH&S, has agreed to travel from Dow Headquarters in Midland, Michigan, in order to spend the day in New York City with the South African delegation. He will focus on the role that an integrated management system plays in developing, achieving and maintaining EH&S policies, standards and performance goals

10h00 *Understanding Management Systems, including Responsible Care and ISO-14001*

11h00 *The Value of a Management System Approach to Achieving Policies and Performance Results*

12h00 Working lunch with Mr. Rose and Charles Iceland, Program Manager, World Environment Center

14h00 *Implementing an Integrated Management System*

15h00 *Case Study: Dow's Operating Discipline Management System and its Role in Achieving Company Policies, Standards and EH&S Performance Goals*

16h00 Adjourn

THURSDAY, SEPTEMBER 25

Today's meetings were arranged by the World Environment Center (WEC).

9h00 – 12h00

Pfizer Inc.

235 East 42nd Street, Room 40, New York, New York

tel: (212) 573-1000

website: www.pfizer.com

Overview:

Pfizer discovers, develops, manufactures, and markets prescription medicines. The company has three business segments: health care, animal health and consumer health care.

Agenda:

9h00

Elizabeth Girardi Schoen, Senior Director, Environmental Affairs
Pfizer's Green Chemistry Initiatives

10h00

Tom Polton, Director, Health, Safety and Occupational Toxicology
Safe Handling and Storage of Hazardous Materials

11h00 – 12h00

Dr. George Mellendick, Director, Occupational Medicine, and Tom Polton
Occupational Health Manager (OHM) System: How Pfizer Maintains and Communicates its Database for Industrial Hygiene Testing to its Medical Personnel

13h30 – 15h30

Meeting with representative from Alcoa Inc. at Pfizer Inc. World Headquarters

Alcoa website: www.alcoa.com

Overview:

Alcoa is the leading producer of primary aluminum, fabricated aluminum and alumina. Its products are used worldwide in chemicals, aircraft, automobiles, beverage cans, buildings, sports and recreation, and a variety of industrial and consumer applications. Alcoa is active in all major aspects of the industry, including technology, mining, refining, smelting, fabricating and recycling.

Agenda:

Bob James, Director, Worldwide Health

Alcoa's 20/20 EH&S Strategies

Balanced Scorecard Milestones and Systems for Tracking Performance

Progress Towards Achievement of EH&S Goals

FRIDAY, SEPTEMBER 26

10h00 – 11h00

Environmental Defense

257 Park Avenue South, 17th Floor, New York, New York

tel: (212) 505-2100

website: www.environmentaldefense.org

Overview:

Environmental Defense, a non-profit, non-partisan organization, is one of the country's most influential environmental advocacy groups. It arguably helped launch the modern environmental movement by winning a ban on the pesticide DDT, thus showing how a small core of concerned individuals can use science and the law to bring about national reform. Guided by science, Environmental Defense evaluates environmental problems and works to create and advocate solutions that win lasting political, economic and social support.

Agenda:

Marcia Aronoff, Vice President for Programs

Overview of Work in Global Warming

Partnership for Climate Action: A Collaboration between Environmental Defense and Industry to Reduce GHGs and Other Industrial Pollutants



WASHINGTON, D.C.

As the nation's capital, Washington, D.C. enjoys a unique place among American cities, also functioning in many ways as a state and county. The founders of this country believed that the seat of government should not be contained in a state, but rather should be a separate entity under the federal government's control. Because of intense interstate competition, they feared that if the capital were under the jurisdiction of anyone state that the state could exercise power and authority over federal matters and, consequently, over the other states.

The dream of a permanent home for the national government had been a long time developing just as it had taken over a decade for the original 13 states to win their independence and agree upon the Federal Constitution. Since the colonies had declared independence from Great Britain in 1776, the capital had moved from place to place - including New York City -until

finally, in 1790, a site was selected on the Potomac River for the permanent seat of government. The U.S. Congress chose the Potomac as a natural midpoint that would satisfy both northern and southern states, whose cultural and political differences were becoming apparent well before the Civil War. Washington saw this spot across the river from his home in

Mount Vernon (Virginia) as the gateway to the west and a continental nation.

The State of Maryland and the Commonwealth of Virginia agreed to cede a ten-mile square (26 sq km) area of land for the new capital. The three commissioners whom Washington appointed to manage the transformation of the area into the Nation's Capital named it the City of Washington in the District of Columbia, in recognition of the First President's preeminent role in the creation of the new nation.

In 1861, the Civil War focused new attention on Washington, D.C., bringing temporary hospitals and armies to its outskirts. The war's chaos and expense led city residents to wonder whether construction of the still- uncompleted Capitol dome might not be suspended. President Lincoln responded, "If people see the Capitol going on, it is a sign we intend the Union shall go on".

Sources: *Lonely Planet Worldguide*, United States Capitol Historical Society

Harnessing Technology Transfer for Sustainable Development Projects

**CHIETA and Representatives of the
Chemical Industry – South Africa delegation**

**Washington, D.C.
16 September 2003**

**Gilbert Jackson, Ph.D.
Technology Transfer Office**

U.S. Agency for International Development



CONTENTS

- ◆ **Sustainable Development**
- ◆ **Technology Transfer**
- ◆ **USAID's Role**
- ◆ **USAID Successes: Case Study in the Latin America and Caribbean region**
- ◆ **The Challenges Ahead**



Sustainable Development

Context:

- **Agenda 21 – Rio 1992: “promote, facilitate and finance as appropriate, the access to and transfer of ESTs (environmentally sustainable technology) and corresponding know-how, in particular to developing countries”**
- **Rio + 10 – Johannesburg 2002 Plan of Implementation priorities: poverty eradication, sustainable consumption and production, and sustainable management of natural resources**

Situation:

Developing countries must grow economically without continuing to degrade their environment.

Challenge:

Transferring technology to the developing world at an affordable cost



Sustainable Development

Classic Definition:

"Meeting the needs of the present without compromising the ability of future generations to meet their own needs."

United Kingdom Definition: "Sustainable development is about ensuring a better quality of life for everyone, now and for generations to come."

Question:

How do we pursue sustainable economic growth without negatively impacting the environment?



Growth with a Small Footprint: Technology Transfer for Sustainability

Technology Transfer is integral to the solution:

USAID promotes innovative technology solutions in energy, environment, and information technology that enable SMEs and municipalities in emerging and underdeveloped markets to increase efficiency and competitiveness and solve development problems leading to a more robust foundation for economic growth.



Pollution Response Options

- 1. Do Nothing**
- 2. Discharge to Environment**
- 3. Treat at End-of-Pipe**
- 4. Prevention**



The Waste Management Hierarchy

Reduction at the Source



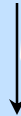
Recycle within the process



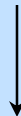
Recycle within the Plant



Recycle Outside the Plant



Waste Treatment

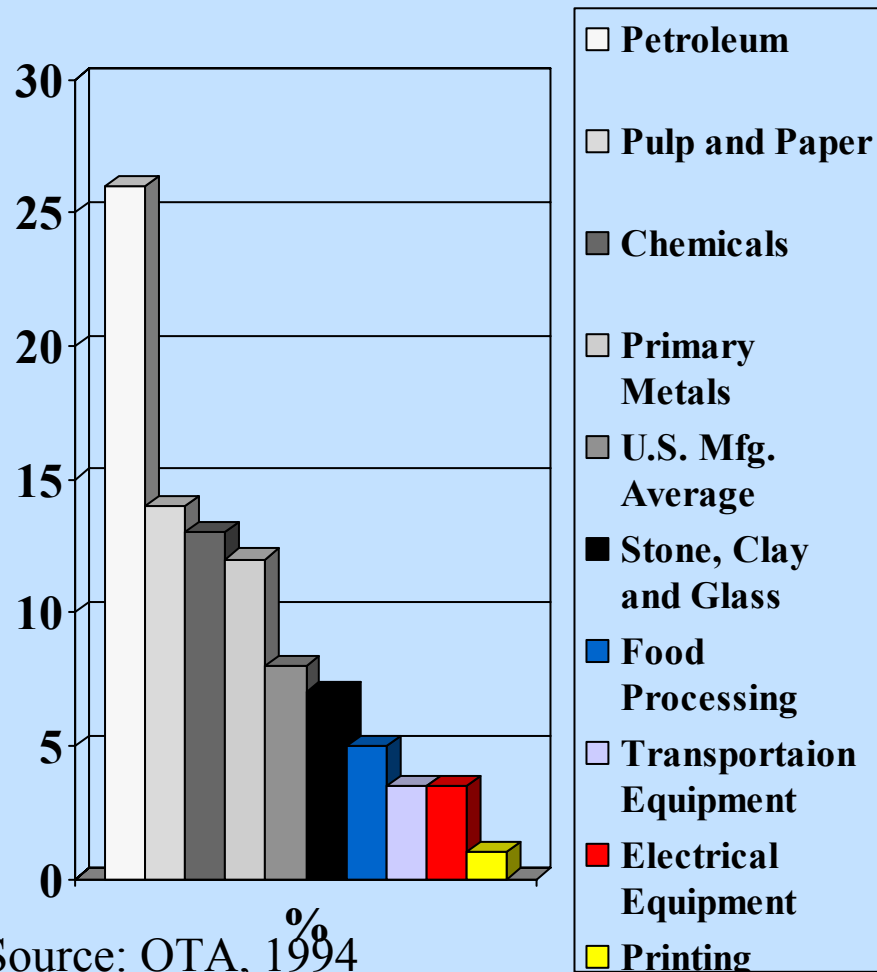


Landfill Disposal

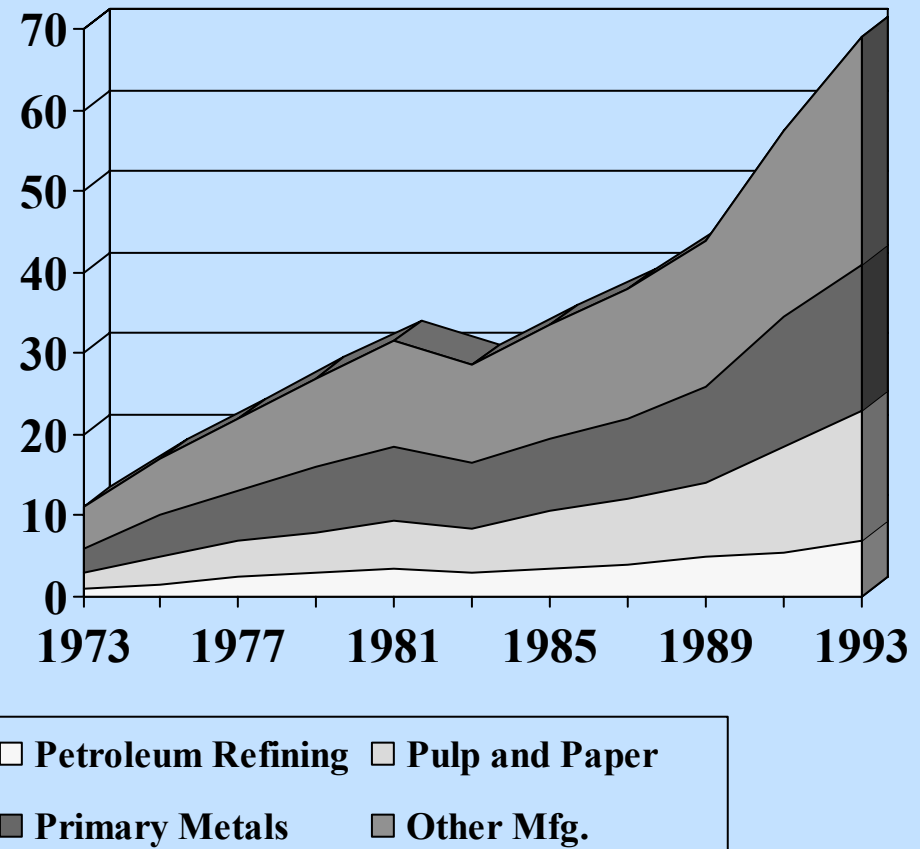


U.S. Industrial Experience: Cost of End-of-Pipe Control Technology

Percent of Capital Expenditures (1993)



Treatment Costs and Expenditures (1973 - 1992) in US\$ billion



Growth with a Small Footprint: Technology Transfer - Why

Technology Transfer helps firms become more competitive, fostering economic growth, jobs, and more stable democratic societies

Firms need to become more competitive because of *Globalization*

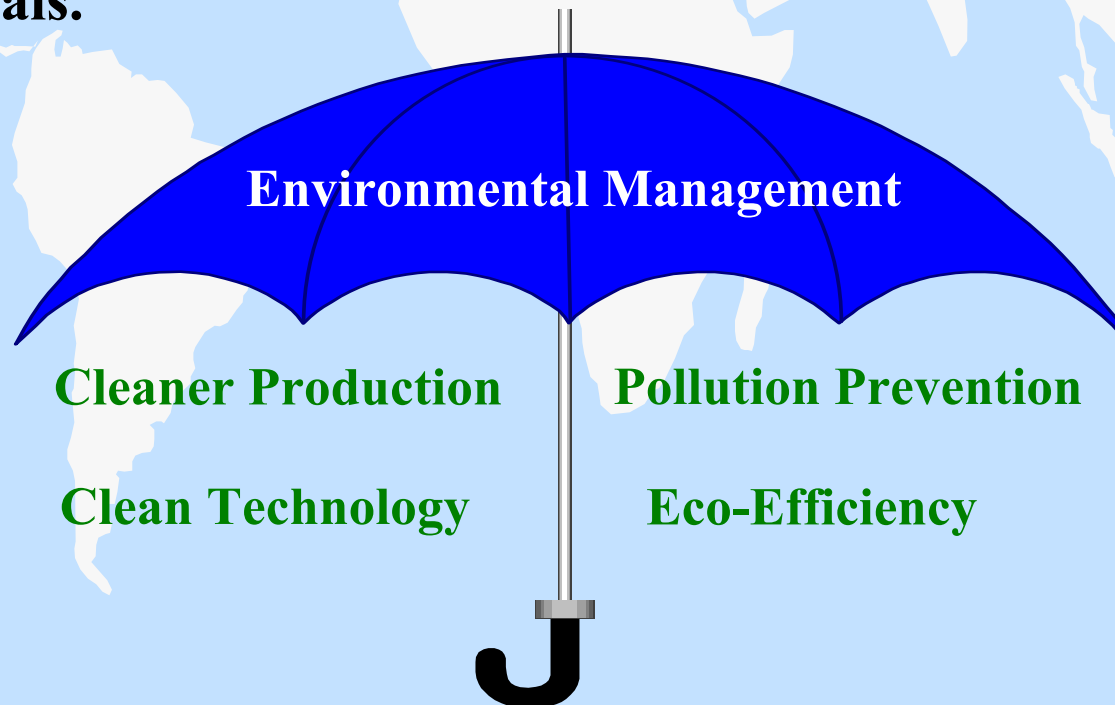
- 1. Proliferation of Free Trade Agreements (FTAs)—NAFTA, Chile, CAFTA, Morocco, S. Korea, Jordan. FTAs are not just about trade, but *development, opportunity, and hope*.**
- 2. Increasing export market requirements (particularly in the U.S. and Europe)**
- 3. Increasing importance of certifications and standards (FSC, Eco-OK, Green Globe, Organic, ISO 14000, etc.)**



Growth with a Small Footprint: Technology Transfer - How

Technology Transfer for environmental management entails preventing waste at the source.

- Techniques can include: good housekeeping, better management, processes modification, new and more efficient technologies, recycle/recovery, raw material substitution to less polluting materials.



Growth with a Small Footprint: Environmental Management Example

Reduction at the Source

Change Product

- ☞ Design for reduced environmental impact
- ☞ Increase life of product

Change Process

Improve Operations

- ☞ O&M processes
- ☞ Administrative practices
- ☞ Segregate Effluents
- ☞ Improve management of materials
- ☞ Organization of production
- ☞ Inventory control
- ☞ Training
- ☞ Segregate wastes

Change Technology

- ☞ Know-how
- ☞ Increase automation
- ☞ Improve operations
- ☞ Improve equipment
- ☞ New technology
- ☞ Greening supply chain

Raw Material Changes

- ☞ Purify materials
- ☞ Substitute materials for less toxic alternatives



USAID's Role: Catalyst for Competitiveness

Traditional Federal Role →

1. Federal Investment
2. R&D
3. Intellectual Property

Traditional Private Sector Role →

4. Private Investment
5. Prototyping
6. Product Development
7. Commercialization

USAID's Role Today →

7. Catalyst:
 - market framework
 - technology demonstrations
 - training / TA



USAID's Role Technology Transfer

Challenges (#1)

In Developing Country Markets:

- **Low demand – regulations tend to emphasize end-of-pipe treatment solutions rather than prevention. Also, the vast majority of businesses are technology laggards, resisting change.**
- **Financing – access to credit and guarantees is problematic.**
- **Technical capacity is nascent, yet many U.S.-trained.**



USAID's Role Technology Transfer

Challenges (#2)

Transferring U.S. Technology to Developing Countries:

- **U.S. technology providers must develop viable business plans that recognize the local market capacity to absorb and adapt new technology, as well as further innovate.**
- **Half-life of U.S. innovation is very short, and is very costly.**
- **Must consider technology transfer within the context of developing country capacity, know-how, customs, entrenched practices, regulations, language, culture, management norms, infrastructure/system requirements, financing barriers, with local partners.**



USAID's Role Technology Transfer

Approach:

- **Identify innovators/pioneers in developing countries to adopt technology and demonstrate applications to other early adopters. Emphasis on key economic sectors (contribution to GDP, employment, annual growth)**
- **Assist U.S. technology providers to identify potential markets and partners, including investors.**
- **Increase drivers of demand: support for FTA's, certifications, policy, regulatory compliance, etc.**



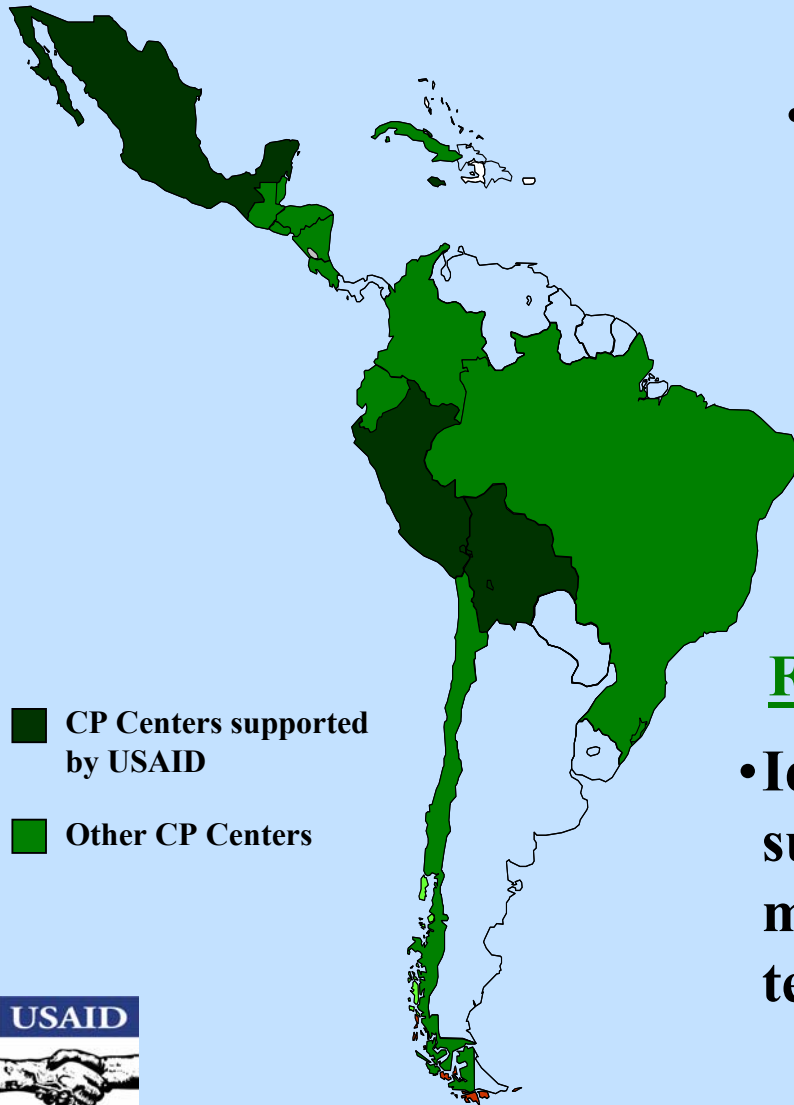
USAID's Role Technology Transfer

Tools:

- **Technical assistance, training, institutional strengthening**
- **Professional exchanges**
- **Demonstration projects**
- **Case study dissemination**
- **Publications, conferences, workshops**
- **Partnerships with U.S. and local entrepreneurs, Missions, businesses, investors, other donors, NGOs, technology centers, and universities.**



Results in LAC: A Case Study



Policy Support:

- Enhanced regulatory and institutional capacity of relevant government agencies and municipalities

Financing Support:

- Identified and supported financing mechanisms for technology transfer

Industrial Sectors:

- Cement
- Chemicals
- Electroplating
- Fish meal
- Food & beverage
- Hospitals
- Leather tanning
- Metal finishing
- Mining
- Paper and wood
- Textiles
- Tourism



Results: Bolivia Case Study

Implementation of cleaner production practices at eight industrial facilities in Bolivia has achieved substantial environmental and economic results



◆ Environmental Results

- Reduced Organic Discharge
 - ☞ Decrease of 3.7 million kg BOD/year
- Water Savings
 - ☞ 3.8 million m³/year = 2 mo. of water for city of La Paz (water is a sensitive political issue)

◆ Economic Results are Dramatic

- Financial Savings
 - ☞ US \$1 million/year



Results: Mexico Case Study

Implementation of cleaner production practices at PEMEX – world's 7th largest oil producer

◆ Focus on Training and EE/CP Audits

- Energy Efficiency/Cleaner Production Audits
- Reduced waste and pollution
- Carbon credits
 - ☞ 3.1 million tons of CO₂ reduced in 2002
- Created EE/CP Website
- Instituted internal train the trainer program



◆ Financial Savings

- US \$500 million in two years
- Projected savings of \$1.2 billion by 2011



Results: Ecuador Case Study

Implementation Results for the Recommended Pollution Prevention Measures in Ecuador

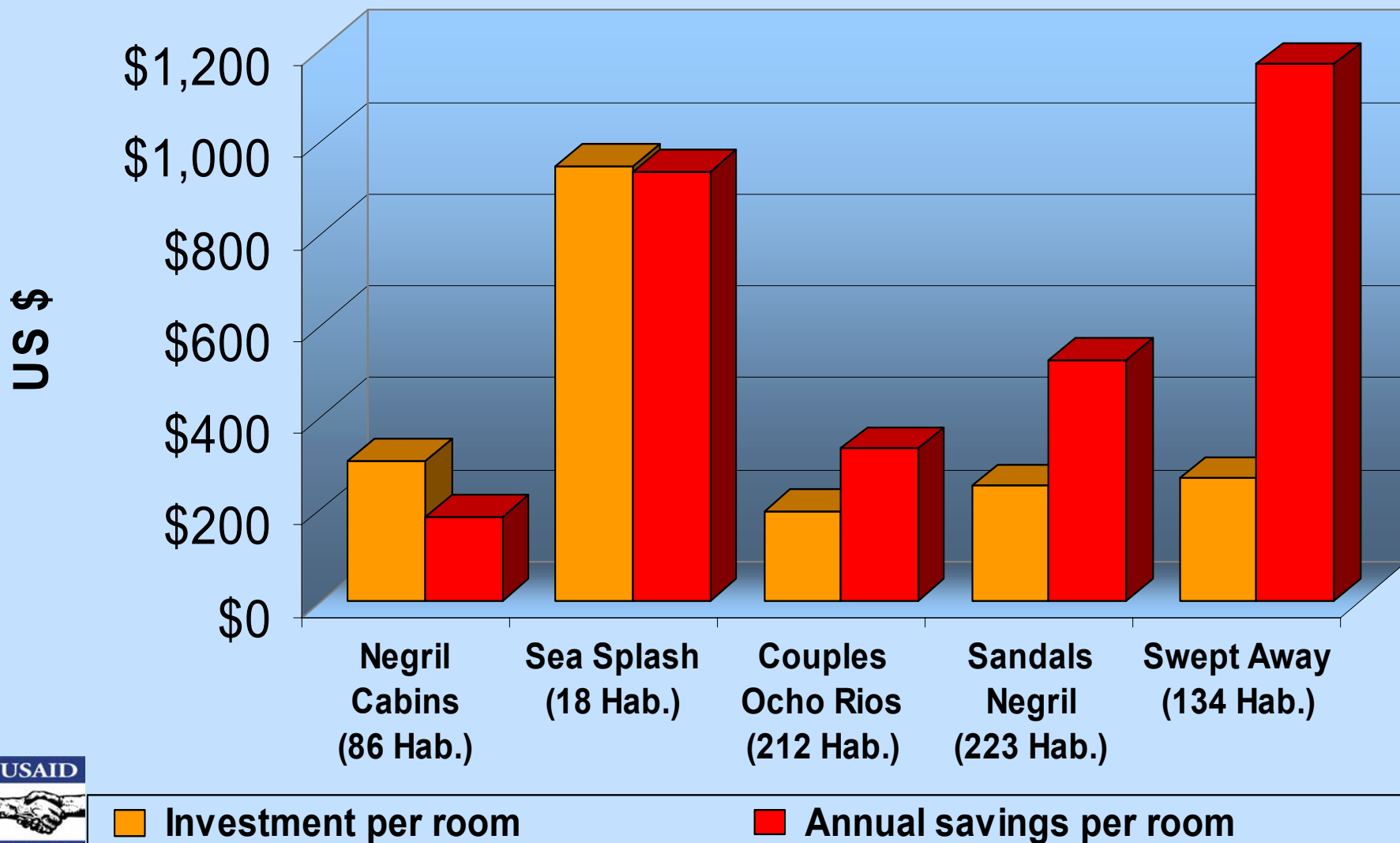
Sector	# of Plants	No. of P2 Options Identified	Investment Size (\$)	Annual Savings (\$)
Tanning	5	42	297,000	294,070
Textiles	2	33	64,500	195,800
Paper	2	18	1,063,200	1,719,800
Ceramics	2	17	1,199,140	1,038,690
Car Assembly	2	12	374,000	409,450
Edible Oil	1	7	281,000	283,000
Palm Oil Extraction	1	7	460,000	943,770
Aluminum Anodizing	1	7	361,000	277,000
<i>Total</i>	<i>16</i>	<i>143</i>	<i>4,099,840</i>	<i>5,161,580</i>

Average payback = 10 months



Results: Jamaica Case Study

Hotels in Jamaica: Environmental Management



Results: Peru Case Study

Loan Guarantee Fund for Technology Transfer

Aspects of the Credit Line:

Banco de Crédito >> **BCP** >>

- **US\$2 Million**
- **Full faith and credit of the U.S. Government for 50% of borrowed principal**
- **Loans through the Banco de Crédito del Perú**
- **Loans in US\$ and local currency, up to \$400K**
- **Loans for purchase of cleaner technology and associated services (two loans recently approved)**



The Challenges Ahead

USAID's Technology Transfer group will continue to play a catalyzing role in fostering innovative technology transfer worldwide

Finance - the Key to More Significant Investments

- ☞ Partnering with banks, donors, and the private sector

Regulation - Institutional Reform

- ☞ Removing market barriers to innovation and technology transfer

Technical

- ☞ Developing local technical capacity
- ☞ Enabling “leap-frogging” to absorb more advanced technology

Taking the Larger View

- ☞ Identifying and catalyzing market demand
- ☞ Fostering bilateral and regional cooperation
- ☞ Meeting free trade agreements

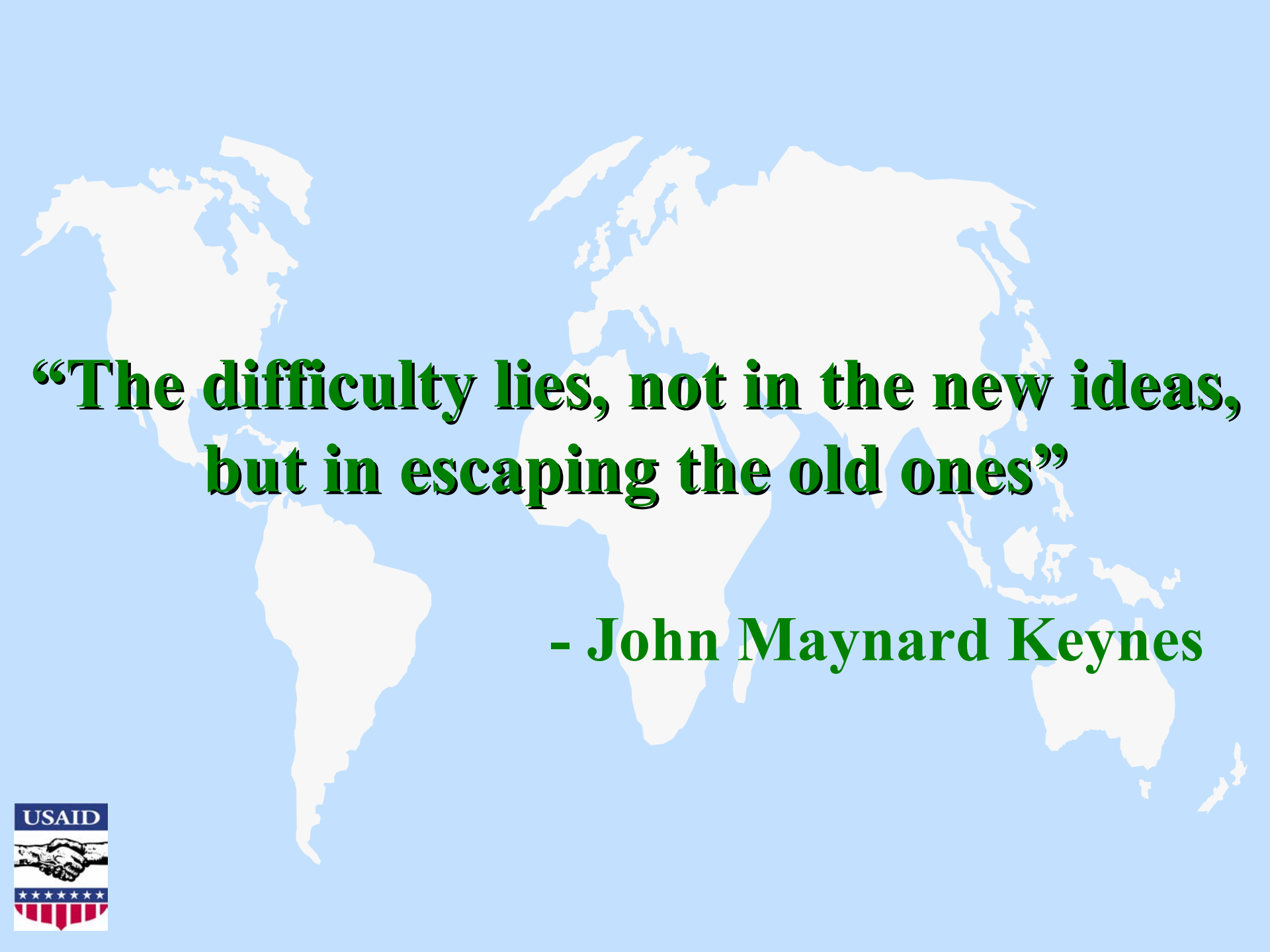


The Challenges Ahead: How Can We Collaborate?

Ongoing USAID programs are emphasizing:

- **Technical capacity building**
- **Supply chain management and eco-certification**
- **Technology incubators**
- **User-producer networks**
- **Waste exchanges: e-based network**
- **Financing solutions: reducing investment risk**
- **Regional networks with industry associations**
- **Others: rapid economic gains via technical solutions**





**“The difficulty lies, not in the new ideas,
but in escaping the old ones”**

- John Maynard Keynes



WILMINGTON

Lying midway between Washington, DC and New York City, Wilmington is the northernmost city in the second smallest state and the "First State" in the Union. Delaware enjoys the latter distinction because it was the first state to ratify the new Constitution of the United States in 1787.

The Delaware Valley's earliest permanent Old World Settlement began in Greater Wilmington in 1638 when the Kalmar Nyckel, a Swedish warship, landed at "The Rocks", a natural wharf in the Christina River, and founded the Colony of New Sweden. New Sweden passed to Dutch and then English control before finally becoming part of William Penn's Pennsylvania Colony in 1683. In 1731, about a mile upstream from this settlement, Thomas Willing laid out along the Christina River what he called "Willingtown". Soon Willing's influence was challenged by other settlers and the town was chartered by the Crown in 1739 as Wilmington, in honor of an ally and friend of William Penn.

Agriculture and fur trading with Native American trappers were the area's first industries. By the end of the 1600s, the Brandywine Village had been established upstream along the swift-flowing Brandywine River, with mills for grinding corn and wheat. With fertile land, abundant forests and well-protected access to the Delaware River and the Atlantic Ocean, the area became a center of milling, distribution and shipbuilding.

In the 1780s and '90s paper and cotton mills were added to the Brandywine Village's existing flour mills. Fleeing the excesses of the French Revolution, Eleuthere Irenee du Pont de Nemours settled in the area in 1802, purchasing property along the Brandywine and opening his black powder mill. From 1802 to 1921 these and other local mills produced powder for America's hunters, soldiers and construction projects, including the War of 1812, the Mexican War, the Civil War, the Transcontinental Railroad, the Spanish-American War and the Panama Canal. From these gunpowder mills sprang the modern chemical industry which is still headquartered in the Wilmington area.

Source: Greater Wilmington Convention & Visitors Bureau

NEW YORK CITY

This "city of islands" became "Greater New York" in 1898 when a charter was adopted which joined together the boroughs of The Bronx, Manhattan, Brooklyn, Queens and Staten Island.

The Ellis Island Immigration Station officially opened its doors to the world on January 1, 1892. Annie Moore, a 15-year-old Irish girl, was the first to be questioned in the station's registry room. From 1892 to 1924, 12 million more immigrants entered the United States through Ellis Island. Among the immigrants who passed through Ellis Island and went on to illustrious careers: Irving Berlin, Bob Hope and the von Trapp Family of "Sound of Music" fame.

In the 1920s, a sportswriter for the *Morning Telegraph* overheard stablehands in New Orleans refer to New York City's racetracks as "the Big Apple." He named his column "Around the Big Apple." A decade later, jazz musicians adopted the term to refer to New York City, and especially Harlem, as the jazz capital of the world.

A mecca for African-American culture and life for more than a century, Harlem started out as Nieuw Haarlem, a prosperous Dutch farming settlement. By the turn of the 20th century, black New Yorkers started moving uptown into Harlem's apartment buildings and townhouses. The neighborhood prospered and by the 1920s Harlem had become the most famous black community in the United States. The Harlem Renaissance, generally regarded as occurring between 1919 and 1929, was Harlem's golden era, when local writers such as Zora Neale Hurston, W.E.B. DuBois and Langston Hughes achieved literary recognition. Although the Depression hit hard here, the neighborhood has enjoyed resurgence in recent years, attracting such well-known figures as Bill Clinton who chose Harlem for his post-presidential office.

Source: NYC & Company



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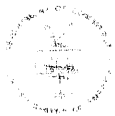
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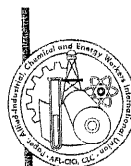


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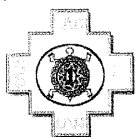
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